Does lifestyle matter?: growth and Cortisol as measures of well-being in Ethiopian children

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Growth and cortisol as measures of well-being in Ethiopian children

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Declaration and statement of copywrite

The material included in this thesis is a result of my own work. In all cases, material from others is acknowledged, and quotations and paraphrases suitably indicated.

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DOES LIFESTYLE MATTER? GROWTH AND CORTISOL AS MESURES OF WELL-BEING IN ETHIOPIAN CHILDREN

HANNAH DOBROWOLSKA

Abstract

Well-being, in terms of anthropometry and salivary cortisol, was compared in four groups of eighty children in Addis Ababa living markedly different lifestyles. The groups were street living children who lived and worked on the street, street working children who worked on the street while residing with their families, poor non street children who lived in impoverished urban households but did not work on the streets and middle class children who attended a private school. Results show middle class children to have better growth status than each of the three less privileged groups. More interestingly street working children are less underweight and wasted, and have higher body fat levels and mid upper arm circumference, than poor non street children. Street living children have higher body fat level than poor non street children, but do not differ on other measures. On no anthropometric measure are there differences between street living and street working children. In all groups girls showed better growth status than boys. No anthropometric measure correlates with cortisol data. Mean cortisol levels were found to be higher in street working and poor non street compared to street living and middle class children. Afternoon coefficient of variation was lower in street working children than each other group, though there were no differences between lifestyle groups for morning cortisol variation. Cortisol profiles over six days are presented and discussed in relation to daily behaviour; the difficulty of interpreting these results is highlighted. The potential role of hormones in mediating between environment and lifestyle, and between health, well-being and behaviour, is exciting. This study makes an initial contribution to such work.

Chapter 1 - Introduction

This research project was designed to investigate three specific aspects associated with well-being of children in Addis Ababa, Ethiopia.

a) Differences in growth status between children living different lifestyles, with the hypothesis that street children do not systematically show the poorest growth status.
b) Cortisol mean levels and cortisol variability, exploring differences associated with lifestyle groups.
c) Correlations between anthropometry and cortisol.

In addition, careful consideration is given to the difficulties associated with analysing such data. Selected cortisol profiles are presented and discussed

This chapter provides an introduction to the research project, particularly its background in terms of similar research in Nepal. General information is given covering Ethiopia, Addis Ababa and the street children of Addis Ababa. Wider issues associated with understanding street children and with defining street children are also discussed.

1.1. Background and Overview

Research with street children is currently popular, yet the focus has been primarily on social issues; causes of joining the street, social networks, survival strategies and substance use, to name a few. From the standpoint of biological anthropology street children remain an understudied population. Numbers of street children are increasing worldwide and are most notable in less developed countries. Factors most commonly associated with the existence of street children are poverty, abuse and modernisation (Aptekar, 1994). 'Streetism' is a lifestyle incongruent with the social and cultural values of most countries, making street children not only materially, but also socially and psychologically, vulnerable. This study compares some biological outcomes of varying lifestyles in Addis Ababa to analyse the potential health implications of life as a street child, in relation to ecologically appropriate comparison groups.

Recent research in biological anthropology has produced unexpected findings which challenge widely held assumptions about the health of street children. These add strength to the emerging view from social anthropology that joining the streets is a

rational decision for many poor children. Increased understanding of the lives of street children indicates that there may be circumstances equally bad, or even worse, than growing up on the street. Comparative research in Jakarta found street children (aged 8 to 15) weigh more and are taller than their slum dwelling peers (Gross, Landfried and Herman, 1996). Similarly, an interdisciplinary study of boys (aged 10 to 14) in four contrasting environments in Nepal (homeless, slum dweller, urban middle class and rural villagers) found homeless street-children achieved better growth status than slum-dwellers (Panter-Brick, Todd and Baker, 1996). That study also compared levels of cortisol, often described as a hormonal marker of "stress". Homeless boys averaged higher mean cortisol values than rural villagers, but showed low cortisol variance, "indicating low reactivity to day-to-day events, despite the apparent insecurity of their way of life" (Panter-Brick, 1998a:92). Such methodology, with improvements in saliva assays, adds a new and exciting perspective to well-being and is ideally suited to cross-cultural biological anthropology research. These findings, together with ethnographic data, suggest that given the context in which many poor children live, street children may have reasonable growth status, habituation to chronic stress, and effective behavioural strategies to cope with homelessness. Worth noting also are data from Kingston, Jamaica, showing stunted children to have increased responsiveness to induced physical and stress levels as compared to adequately nourished children (Fernald and McGregor, 1998).

These intriguing data warranted corroboration in other cultural settings. The present study set out to explore the relationships between demographic background, growth status, cortisol hormone, reported morbidity and day-to-day behaviour, for four groups of Ethiopian children living markedly different lifestyles. The street children categories are based on UNICEF's (1984) definitions of *on* and *of* the street children. *Street living children* are those who live and work on the street, generally having little contact with their families. *Street working children* work on the street mainly for economic reasons, returning to their family to eat and sleep. In this study, I distinguished a third disadvantaged group, *non street poor children*, who come from similar socioeconomic status backgrounds to the two street children groups, but these children have no economic contact with the street. Lastly a group of *middle class children* with optimal living conditions form an ecologically and genetically valid comparison group. Differences in measures between the three disadvantaged groups are of particular

interest, since better measures from the privileged middle class group are to be expected. The methodology employed combined anthropometric measurements, hormonal data and lifestyle information for each child.

Two complementary approaches were taken. Firstly, anthropometric, cortisol and lifestyle data were collected from approximately 80 children in each of four research sites, providing cross sectional baseline measures of aspects of well-being across lifestyles. Secondly, six day longitudinal data comprising twice daily cortisol measures and daily activity information were gathered from approximately 15 children at each research site. This was in order to corroborate cortisol findings from the first phase and to investigate ways to shed more light on cortisol variation at an individual level.

1.2. Why Ethiopia? Comparisons with Nepal

Ethiopia was chosen as a research site because in terms of street children, it provided a context markedly different to that of Nepal. The Nepal research was treated as a relevant comparison as the similar methodology employed facilitated direct comparison of the data sets. Despite many similarities, by way of introduction, the indicators outlined in table 1.1 show the people of Ethiopia, on the whole, to experience poorer health and economic conditions than Nepali. The comparison of the numbers of street children in each country is hampered by accurate estimates of the numbers of street children, which are notoriously difficult to achieve particularly because the category "street children" includes both homeless (street living) and home-based (street working) children (see notes on table). Figures are presented as an indication of the phenomenon in each country, but should be taken with caution.

Table 1.1. Basic national indicators for Ethiopia and Nepal

Indicator	Ethiopia	Nepal
Population of country (1995)	55.1 million	21.9 million
Population under 18 (1995)	29.0 million	10.7 million
Population under 5 (1995)	10.5 million	3.6 million
Population of capital city	4 million[1]	
Altitude of capital city	2,200 m[1]	1,300 m[2]
Urbanized population (1995)	13 %	14 %
Average annual growth rate of urban population (1980-95)	4.4 %	7.5 %
GNP per capita (1994)	US $ 100	US $ 200
Urban population below absolute poverty level (1980-89)	60 %	55 %
Daily per capita calorie supply as % of requirements (1988-90)	73 %	100 %
Under 5s mortality rate per 1000 (1995)	195	114
Life expectancy at birth (1995)	49 years	55 years
Wasting (moderate and severe) in under 5s (1990-96)	8 %	6 %
Stunting (moderate and severe) in under 5s (1990-96)	64 %	63 %
Underweight (moderate and severe) in under 5s (1990-96)	48 %	49 %
Adult literacy rate (1995) male / female	46 / 25 %	41 / 14 %
Enrollment in primary school (1990-95) net male / female	33 / 24 %	80 / 41 %
Estimated number of street living children in capital city	9,640[3]	500-1,000[4]
Estimated number of street working children in capital city	36,260[3]	NA
Estimated number of street living children in country	21,000[3]	500-1,000[4]
Estimated number of street working children in country	79,000[3]	NA

Sources: Except where otherwise indicated, all figures are taken from UNICEF (1997) State of the World's Children - 1997

1. Parker (1995)
2. Panter-Brick *et al.* (1996)
3. This figure is for children aged 5-17. It is calculated from the absolute number of street children in Ethiopia being 100,000 (Taçon, 1991) and the proportions of street children in Addis Ababa as 45.9% of the total in the country; and the proportions of street living children (26.3%) compared with street working children (73.5%) (MOLSA, 1995). This figure should be taken as an estimate since Taçon has been challenged for overestimating the number of street children in a variety of contexts.
4. Child Workers in Nepal (CWIN) records give the number of homeless street children as 500 in 1990-93 (cited in Panter-Brick *et al.*, 1996). The figure for 1997 is closer to 1,000 homeless street children (Panter-Brick, pers. com.). Katmandu is the main location of street children in Nepal, so this figure is the same for the capital city and the country as a whole.

Both nations are developing countries and have high levels of poverty, a factor intimately associated with causes of street children. Ethiopia's recent history of civil war and famines left huge numbers of children orphaned. Both Ethiopia and Nepal have (re)gained democratic governments in the early 1990s. For Ethiopia this has created a relatively unstable political climate, with massive social and economic problems with which to deal. In terms of social data immediately relevant to the street children phenomenon, are the numbers of street children in Addis Ababa which far outweigh those in Katmandu. Cultural attitudes towards the street children may vary despite both counties have strong (religiously based) alms-giving cultures. It is said that "Ethiopians tend not to criticise poverty as it is seen as an act of God, a traditional part of Ethiopian society" (Belayneh, 1994). Nevertheless I often observed Ethiopians reprimanding children for begging, telling them instead to find a job. The type and accessibility of support available to the children through NGO programs in the two countries will also impact upon their lifestyles. Conditions and expectations of the poor non working slum dwelling children in each setting may vary considerably. Without greater knowledge of Nepal, it is difficult to compare the two environments further. Nonetheless, compared to reports of street children in South America (e.g. Hecht, 1998), some final obvious similarities between Ethiopia and Nepal concern the low substance use and rarity of brutal and blatant violence directed against the street children.

The limited amount of international research conducted with street children in Addis Ababa (indeed in Africa as a whole) provided a second attraction. It was hoped that unlike reports from elsewhere where street children are seemingly bombarded by research and reluctant to take part (Van Beers, 1996). Research by aid organisations is on the whole small scale and rightly action orientated. Government funded research is survey based and aims to assess the magnitude and dimensions of the street children "problem", with a focus on causation and the policy outcome needs. Biological anthropology research, in particular, would still be novel and therefore more engaging for the children.

1.3. Ethiopia: Peoples and History

Ethiopia holds a "special status in African and black history" as the only African country to have defeated the might of a European power at the Battle of Adwa in 1896 (Parker, 1995:10). It remains the only African nation to have escaped colonialism. Ethiopia's long and impressive history is highlighted by the discovery of *Lucy*, hominid remains dating back 3.5 million years and granting Ethiopia the title "cradle of mankind". Christianity in Ethiopia dates back to AD341; a time when Europeans practiced paganism. Now, having incorporated elements of Judaism into its faith, Orthodox Christianity lives along side a thriving Islamic population (54% and 33% of the population respectively, 1984 census, cited in Hailemariam and Asrat, 1996).

The people of Ethiopia are rightly proud of this impressive distant history, yet Ethiopia is plagued by its recent history which has delivered little but misery. It is these memories of political turmoil, war and famine that are most prominent in the outsider's perception of Ethiopia. Following the 1974 revolution (in essence a military coup) the Derg ruled Ethiopia under the name of socialism; a strict regime of curfews, purges and fear ensued. Desperate famines of 1972/74 and 1984/85 left approximately 0.9 million dead. Civil war against rebels in the North raged for over 30 years paralysing the nation and contributing to the famines. The early 1990s finally brought peace, the independence of Eritrea, and the subsequent emergence of a democratic government in Ethiopia. Ethnic differences, desperate poverty, large foreign debts, ongoing human rights abuses and recent memories of famine, war and oppression, present unique difficulties for the future of Ethiopia. Sadly, any chance of stability and development through the new social and economic order is threatened by volatile relationships with neighbouring countries.

At the interface of the African and Arab worlds, Ethiopia's cultural diversity is demonstrated by the 80 ethnic groups and 64 languages within its borders (Parker, 1995:6). This includes the Oromo, considered to be one of largest tribes in Africa. Ethiopia is the second most populous country in Africa, it is also the third poorest country in the world and one of the least developed. UNICEF estimates that 62% of people live below the absolute poverty line, meaning they are unable to afford an adequate diet and other basic necessities. The average daily per capita calorie intake is

about 1,621 calories, the lowest daily calorie supply in Africa and only 71% of the recommended daily intake (Parker, 1995:42); this is less than a standard relief ration and half of the average North American consumption. Although 90% of the population is engaged in agriculture, food shortages are common and surviving at this critical caloric level leaves little buffer against crop failures. Only 45% of the population have access to health service facilities, with a mere 23% having access to safe drinking water (1994, UNDP cited in Parker, 1995:61). The incidence of malnutrition in under-fives is 47% and nearly two thirds of those children who survive their first five years are physically stunted, leaving their mental development inhibited by malnourishment (UNICEF's situation report, 1993). Nonetheless there are positive signs, infant and under 5s mortality rates are falling and life expectancy has risen from 36 in 1960 to 49 years in 1995 (UNICEF, 1997).

My research was conducted solely in the capital of Ethiopia, Addis Ababa, (lit. 'New Flower'). This city dates from 1887 and stands 2,200m above sea level in the foothills of Mount Entoto. Addis Ababa is a sprawling city of 4 million people; the largest city in the Horn of Africa. It plays host to the headquarters of many international organizations, including the Organization of African Unity and the Economic Commission for Africa. Addis Ababa is a city of contrasts: to the foreigner it is both attractive in its opportunity and horrific in its wealth disparity. Modern buildings and wide open boulevards stand side by side with historic churches and palaces. Yet not far from the main streets are densely populated slum areas, where people reside in mud and wood homes. Less than half the population of Addis Ababa have a latrine (Parker, 1995:52). As in most cities of the world the wealth disparities are blatantly obvious, while the rich enjoy the many night clubs, bars and restaurants, the destitute struggle to survive where the minimum wage of 100 Birr (approximately £9) per month is a legal fiction. "Barefoot shepherds lope along past prostitutes in black leather mini-skirts; beggars implore ambassadors for change; Nuers from the West talk pidgin Amharic with Somalis from the East; Orthodox mystics and foreign evangelists stir up their respective congregations. Not quite harmonious enough to be called a melting pot, Addis Ababa is a series of villages, loosely interconnected but often ethnically defined." (Parker, 1995:51).

1.4. STREET CHILDREN OF ETHIOPIA

Poor children on the streets are a prominent feature within the urban landscape of Addis Ababa; they can be seen playing, begging, working and chatting. Work generally involves selling small items such as chewing gum or cigarettes, shoe shining, working with minibus taxis (either through calling for customers or providing change), guarding cars, running errands or carrying loads. Begging children present themselves as vulnerable victims; with a pitiful, pleading look and an outstretched hand, they declare to potential donors "no mother, no father, zero stomach" - their mother may be no more than a few metres away, or several minutes later they may be seen happily playing with friends or chewing on food (Veale, Taylor and Linehan, in press). Smaller children are particularly vulnerable because, although they make more successful beggars, they often get bullied by older children and adolescents demanding money. The children are mainly clad in dirty, worn out clothes, and shoes are not common. For food the children may return home, receive leftovers from restaurants or buy a cheap meal. If they have had an unsuccessful day they may not eat, although in such circumstances they generally borrow from friends. For those who do not return to their families or live in an NGO shelter, some pay to sleep in someone's house. Others find shelter against walls, generally sleeping with friends. The older children will often smoke cigarettes, chew *chat* (a leaf that when chewed acts as a stimulant and suppresses the appetite) or gamble before sleeping late in the night. Addis Ababa is high in altitude and therefore gets cold at night. Street children in Ethiopia, like many subcultures on the margins of society (Montgomery, 1993), have developed their own argot (anti-language) as a means of confidential communication. Nonetheless, despite their seemingly unconventional and uncontrolled lives, the children have not rejected the wider culture in which they live. They often abide by the religious dictates of the Ethiopian Christian Orthodox Church, they fast and are intensely aware of Holy days.

Information about street children in Ethiopia is available from a survey of 10,000 street children, selected to represent 10% of the total street child population, within 25 cities and towns in Ethiopia. The survey was carried out in 1995 by the Ministry of Labour and Social Affairs (MOLSA), with the aim of increasing understanding of the phenomenon to shape government policy. Survey methods are not considered to be the most reliable, however the figures give a basic picture of street children in Ethiopia.

Forty-six per cent of the sample were based in Addis Ababa, within Addis Ababa 79% of street children see their families every day (MOLSA, 1995) and so "are integrally involved with their families... supporting findings that the main cause of streetism in Addis Ababa is economic involvement rather than separation from the family" (Veale and Adefrisew, 1993:54-55). MOLSA's 1995 survey asked 2,000 parents about their attitudes towards their children's participation in street life: 76% accepted it, with 22% saying they did not accept it. When asked about their reasons for joining the streets 76% of the children throughout Ethiopia cited economic problems or to support the family, 12% due to loss, separation or displacement of parents, 5% due to family disharmony, 2% cited mistreatment at home, 3% due to friends influence and 3% had other reasons. Fifty-three per cent of street children attend school (MOLSA, 1995). Only 13 % of Addis Ababa's street children sleep on the street, while 7% rent temporary shelter (Veale and Adefrisew, 1993).

Approximately three quarters of street children are male (Veale and Adefrisew, 1993). The variety of reasons for fewer girl street children were outlined to me by NGO staff. Most importantly is the position of women in the family and society at large; girls are trusted more than boys and are therefore more able to get work as maids, so providing themselves with an income and often accommodation. Girls are also less likely to be forced into leaving their families because they are deemed to be more useful within the running of the household; whilst boys are socialised into being independent; so leave home at an earlier age. Street life is more dangerous for lone girls as they are more vulnerable to both physical and sexual abuse. This is likely to make them more determined to leave the lifestyle; sadly the progression is often into prostitution. Prostitution is an attractive lifestyle to many young girls, it offers "freedom" and money that could not be enjoyed by those remaining with their families or in the only other alternative, low paid domestic work. According to NGO staff, many girls view sexual diseases and the dangers of violence within prostitution as a worthwhile price.

Delinquency and substance abuse is often associated with street children: in MOLSA's 1995 survey 17% of children reported having used drugs, use was highest (45%) in the 13 to 15 age group. The drugs used were cigarettes (40%), *chat* (34%), alcohol (17%), benzene (7%) and hashish (1%). A high proportion of street children had been charged by the police during their time on the streets for fighting (44%), stealing (15%) and

working in restricted areas (13%). For these crimes 19.6% had gone to prison, 19% received physical punishment, 28% counseling and 25% given a warning. Unlike the streets of Latin America, reports suggest that there is less violence toward street children in East Africa (Lalor *et al.*, 1992, cited in Aptekar, 1994). That is not to say that it does not exist, but that the police although at times harsh with the street children, on other occasions are protective and helpful. I observed the police giving left over food to street children and heard the children speak of going to the police for protection against violence from other street children. However, I also heard reports of the police uprooting people from their (semi-permanent) veranda dwellings and on occasions rounding up street children to dump them outside the city to clean up Addis Ababa's image for important state visits.

1.5. DEFINING STREET CHILDREN

1.5.1. International definitions and terms of this study

Tremendous discussion has taken place over the definition of street children. It is summarised in this introduction since it is relevant to the issue of categorising street children and their lifestyles. The inter-NGO Programme on Street Children and Street Youth have proposed the following definition: "A street child or street youth is any minor for whom the street (in the widest sense of the word, including unoccupied dwellings, waste land etc) has become his or her habitual abode, and who is without adequate protection" (Beasley, 1999:5). The above brief description of street children in Addis Ababa emphasises their non-homogenous nature. This diversity in what is generally seen as a single group of children sharing similar characteristics is common worldwide. Glauser (1997) questions any strict subdividing of street children, arguing that the wider category of street children includes within it a full continuum of children with varying relationships to the street and to their families. Without doubt there are problems associated with any categorisation of street children but considering the huge variety existing within the lifestyles of street children, equally there are problems involved in not differentiating the children.

The UNICEF typology "differentiates between children according to their degree of involvement in street-life and family contact" (Veale and Adefrisew, 1993:3). I have

followed this distinction but employed terms different to UNICEF's for clarity and ease of reading. *Street living children* refer to those who live, sleep and work on the street, generally with little family contact although it may be available to them. *Street working children* reside mainly with their family and work on the street primarily for economic reasons helping to support themselves and their families. These children are not merely called working children because they specifically work on the streets, not elsewhere such as in factories, as domestics or in restaurants. With 60% of the urban population of Ethiopia living below the poverty line (UNICEF, 1997), the majority of children in urban Ethiopia are poor destitute children; those living in poverty stricken households within slum environments. These children form a comparison group and are referred to as *poor non street children.* Such children are at risk in many ways including at risk of joining street life, currently many frequently play on the streets. Their home lives are little removed from those of street working children or the households street living children departed.

1.5.2. Categorising street children – Academic and emic perspectives

It is important to remain mindful that treating these three groups as markedly different and distinct is to some extent misleading, as they are arbitrary divisions. From the opportunistic discussion of this topic with Ethiopian children and from the especially arranged focus group discussions during the study, distinct differences were perceived between street living and street working children. These are illustrated in the following comments, which stem from a series of focus group discussions conducted in Amharic and translated into English by one of my research assistants. Tomas, a street living child from the community NGO spoke about street working children saying: "The difference lies in the fact that they work and wash their clothes. At night, they go home and sleep there with a blanket of their own. Every week they take bath and they can keep clean. While we who live on the street eat if we get it, if not we spend the night hungry. What's more, we rarely wash our clothes, we are full of lice. In many ways they are different to us. If they get sick, hungry or thirsty, their family will take care of them, but we have got no one who will take care of us". Marta, a street working child also from the community NGO commented about street living children saying: "They don't save what they earn because they don't have a family to think of and so they spend the money drinking alcohol and things like that. While we usually save the money we get because

we think of our mother waiting at home". Although the home of the slum children may be materially marginally better than street living children (some sheets of tin), it is the child's social worlds which make the distinction between street living and street working children important. Hecht (1998:108) argues that in Brazil "Home and the street are not concepts attached primarily to physical spaces; they are notions revolving largely around the child's relationship to their mothers and the concomitant implications of this relationship". Street working children are part of a daily interacting family unit within which they receive attention and care. Some distinctions can therefore be made between the needs of street living and working children. Investigating health differences between these groups may add to the debate regarding distinctions between street children categories.

During the study, I asked many people (including street children, other children, NGO workers and other adults) what street children were called in Amharic (the recognised national language of Ethiopia). The (politically) correct term is *godana tedadari* (lit. 'street dwellers'; those who live off the street), however more commonly used is the insulting term *borco* (from the Italian for dirty - *sporco*, or pig - *porco*). Street children reported not to like the term *borco*. I did not use it, although I heard them call each other as such. I have not used Amharic terms to refer to children; I am not familiar enough with Amharic to appreciate the implications of doing so. In addition, although the street children themselves distinguished differences between street living and street working children, the two groups are not easily distinguishable in the Amharic language. Some children and adults would include *street working children* in the terms *godana tedadari* and *borco* and others would not. Glauser (1997) argues that categorisation is based on the opinions and expectations of society rather than the reality of the children's actual lives, and this leads to inappropriate labeling of the children. The term street child is loaded with meaning that can conjure up an array of images from hopeless victim, to worthy worker, to violent thief (Veale, Taylor and Linehan, in press). These stereotypic images never accurately incorporate the whole lives of the children, their background, their hopes, their efforts or their sadness. The street children in Ethiopia are fully aware of the assumptions made about them: "We are called street children because we live on the street and because we don't change our clothes. Street child means a child who snatches or robs from other people, a thief, pickpocket and gambler" (Yennenesh, a girl living in an NGO shelter). The general public often produce opinions that these children

are the most disadvantaged, that they have failed and/or their families have failed them, but there is growing evidence that this is not always the case. An alternative view is that only through children earning can poor families remain intact: "the street is not an acceptable *alternative* to the home, it is a *resource* for nurturing the home" (Hecht, 1998:107, italics in original).

With a gradual increased (but still limited) understanding of the children's lives, I became aware of discrepancies in the research categories employed. Some street children, who lived in shelters or with friends on the street, and so are classed as street children, did in fact have regular contact with their families. Others who now lived in NGO shelters no longer considered themselves to be street living children. In another focus group discussion, Melesse, a boy from the street children NGO who is now living in a shelter and goes to school commented, "*Godana tedadari* [street children] have to do things like smoke, sleep on the verandah, take opium and steal. We have been given a dormitory so that we don't sleep on the street and we don't need to steal, snatch, loot or smoke. Therefore we don't belong to the category of street children". His comments were agreed upon by the other boys involved in the discussion. Of course, it is possible here, as with all the above comments, that he was speaking what he thought I wanted to hear. Nevertheless, the already complex task of categorising the children is especially difficult due to the dynamic nature of these young people's lives.

The discussion above illustrates that there are a range of emic definitions used for street children which themselves may not be concrete. Groupings are fluid and may change depending upon the immediate context. After much consideration I have decided to employ academic classification in this thesis, hence the four groups of children (street living, street working, poor non street and middle class). I am conscious of the potential concerns over the value of such groups considering that, for example, despite Melesse's adamant comments that he is not a street (living) child, the definitions of the categories in this study class him as such. The four groups employed here facilitate analysis of data and will be reviewed in the light of the results.

1.6. THESIS OUTLINE

Having discussed street children and Ethiopia, the next chapter discusses well-being. I give an overview of previous work with street children in terms of psychosocial, physical and physiological well-being. The rational behind using anthropometric and cortisol measures, the main measures of well-being used in this study, is explained.

Chapter 3 is devoted to description and discussion of fieldwork. This is a large section for two reasons. Firstly, on simple time dimensions, the fieldwork filled half of the full-time year dedicated to the Masters degree. I feel very strongly that it is important to be transparent when talking about research methods, particularly in discussing areas that were not ideal and could be improved upon. I learnt much about the children's lives during this time, both at a conscious and sub-conscious level.

Chapter 4 forms, in some sense, an introduction to the results. Firstly, the actual sample is described in some detail. Secondly considerable time is spent explaining the statistical procedures used on the results, so as not to obscure any data analysis process. The difficulties in cortisol analyses due to circadian rhythm are particularly discussed, both in terms of the cross sectional and longitudinal data.

The analysis and results are presented in chapter 5 in a straight forward fashion without discussion. Anthropometry and cortisol data from the first phase are analysed, together with longitudinal data analysis which includes selected children's cortisol profiles.

Chapter 6 forms the discussion and conclusion part of the thesis. Results are evaluated in terms of previous research of anthropometry with street children, social research with street children, and studies of cortisol variation in children. The potential for future studies of a longitudinal nature are discussed, giving suggestions for improvements on this study. Finally the relative importance of studies such as this to biological anthropology and to street children is discussed.

Chapter 2 - Well-being in Street Children: Measures and why they are employed

The following chapter begins by briefly discussing the difficulties around the concept of well-being. Research to date on psychosocial well-being in street children is then detailed in recognition of this important component of well-being and to complete the picture in terms of well-being in street children. Next I move onto research with street children using more quantifiable measures of well-being, namely anthropometry and cortisol. These are the focus of the current study, therefore work to date with street children as well as broader issues surrounding these measures are explored in some depth.

2.1. What is well-being?

Well-being is a term frequently employed. It is immensely important and potentially useful, but often the complexity of the concept is underestimated. Defining well-being is an ambitious, involved and consequential task, it should involve minimally physiological, psychological, social and economic components. The interactive nature of these variables demonstrates the broad and composite quality of well-being, the term should be used with awareness of this and therefore caution. Health is little removed from well-being, although many people assume health indicates a more narrow medical slant. WHO defines health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (cited by Lewis 1986:127). Health should include the ability to function within the societal, biological and environmental context appropriate to the individual, and to respond to future stress. Measuring health or well-being, and the impact of other variables on it, is important for social and biological research, holding implications for social and health policy. To date there remains a considerable lack of understanding of how environmental factors are mediated by the body to produce degrees of well-being. "Standard indicators of ill-health, while useful, often focus on measuring final outcomes (death, slow growth, malnutrition) rather than examining the long-term processes by which children cope with different environments (adaptive behaviour, vulnerability or resilience)" (Panter-Brick, 1998a:6). How can well-being or health, such all encompassing concepts, be measured,

particularly where large numbers are involved and rapid assessment necessary? With what justifications are so called well-being or health measurements made? This study used anthropometric and hormonal measures, with basic social and economic data, and claims only to consider some aspects of well-being.

2.2. PSYCHOSOCIAL WELL-BEING IN STREET CHILDREN

Qualitative research, conducted with the objective of gaining a deeper understanding of the children's lives from their own perspective, helps assess the psychosocial well-being of street children. It may identify the problems that the children face in their daily lives and the coping strategies that they employ to overcome them. It may elucidate the children's perceptions of the police, shop owners, other children and the general public. The researcher aims to gain an awareness of what it means as a child to be given left over food by a restaurateur, to be beaten by the police, to be independent, to enjoy playing with friends, to find money on the street and spend it, or to see other families enjoy religious celebrations together. This helps understand from a qualitative perspective how such experiences and the child's reaction to them impact upon the child's well-being. As such, this research investigates some of the numerous aspects that comprise the phenomenon well-being; material possessions, health, sexual practices, support networks, psycho-social competencies and much more besides. Some of this literature is discussed below in relation to the well-being of street children.

Ennew (1994) described the networks that street children establish, with each individual relationship able to provide certain benefits to the street child. Based on a review of cross cultural research, she presented these networks as involving a wide array of contacts from hoteliers to street educators, to middle class housewives, the police and other street children. Successful street children find the much needed support to survive their harsh lifestyle in peer support networks which some talk of as new families. Even relationships with adults that may seem exploitative to an outsider are in fact controlled by the children themselves. The autonomy and accommodating success of children in establishing social support, and the support itself, must be recognised as a true aspect of well-being.

Eliciting support is a skill incorporated within the concept of social competence. Tyler, Tyler, Echeuevy and Zea (1991) speak of psychosocial competence as an organising framework to understand the multiple ways in which people exercise choice and autonomy in their lives. To be (psycho)socially competent one must be able to achieve one's goals within a range of roles, therefore be able to "anticipate, improvise and to manipulate actions relative to changing circumstances" (Baker, 1998:47). The ability to cope with one's social surroundings with appropriate behaviours that are sensitive to others needs, desires and beliefs are vital in achieving one's own goals within that context. For street children this leads to such abilities as securing left over food from restaurateurs, begging money from the public, fixing a loan from a friend, retaining the love of his/her family, or responding suitably to older children threatening violence. These social competencies in a range of contexts enable children to function successfully as street children, and to use their many environments (street, home, NGO centre, police station, etc.) to their advantage. Social competence is undoubtedly lacking in some street children, just as it is in the wider public, yet Baker (1998) concludes that within their own context successful street children have very sophisticated social competence.

Following research with street children in Bogotá, Colombia, Tyler *et al.* (1991:414) stated that for street children there was "no other way to account for their capacity to form peer-orientated mini-communities as well as personal relationships without viewing them as developing their lives psychosocially. They are responsive to the ecologies of their world and are actively engaged in surviving in relationships to these ecologies, even though these relationships may be hostile". A study in Ethiopia (Hegarty, 1996) found that street children did not have an oversimplified view of the relationship between themselves and the police, but recognised the inherent complexities of the relationship. The street children were therefore able to use the deep understanding of this relationship to their advantage making them more psychosocially competent and in turn less vulnerable than assumptions suggest. Psychosocial skills are intimately linked with well-being, they indicate soundness in certain mental and psychological arenas, whilst establishing the child's ability to secure the many things necessary for other aspects of well-being (food, shelter and support, to name the most obvious). Notably however, these studies frequently omit to discuss the use of a comparative group, findings that street children appear to possess adequate (psycho)social competencies are interesting, however without a suitable comparison group the strength of such finding are limited.

We cannot determine whether such successful psychosocial competence is common in all children or whether street children have more highly developed psychosocial competence for their age compared to other poor children.

Following a review of the studies conducted with street children, Veale (1996:38) concludes that "the majority of street children are functioning adequately (intellectually, emotionally and physically) given the difficult conditions of their lives". This leads her to adopt a rational choice model to explain the process of joining the street, based on the psychological notion of bounded rationality as "good enough" or satisfactory (after Simon, 1978, cited in Veale, 1996). "Bounded by cognitive limitations and imperfect knowledge, individuals do not necessarily seek out the set of conditions which will maximally satisfy needs, but seek a set of conditions that are at least sufficient... While accepting that other behaviour patterns would equally or better operate in similar circumstances the bounded [rational choice] theory posits that street life is chosen as one of a range of alternative options" (Veale, Taylor and Linehan, in press). The rational choice model puts children at the centre of the analysis, it accepts that moving onto the street is a multistage process for most children and that the children make a series of rational choices, based on their cultural beliefs, their own individual experiences and current circumstances. Rational choice also explains children's departure from the street, in clear terms: once the costs of street life outweigh the costs of a different available lifestyle, the child is likely to chose to leave.

Felsman (1981:43) wrote "We tend to regard the abandoning, or runaway, child as troubled, even emotionally disturbed. In the case of these particular children, however, leaving home may be a positive, adaptive move towards physical and psychological health". In Ethiopia too, many street children were found to "demonstrate strong feelings of self efficacy and internal locus of control" (Veale, Hegarty and Finucane, 1997, cited in Veale *et al.,* in press). Nevertheless, we should not allow the psychosocial skills noted in street children to hid the negative impact of street life. Indeed interviews in Ethiopia suggest that street children are "psychologically and emotionally very vulnerable, and often experience trauma in relation to feelings of abandonment" (Veale *et al.,* in press). Many findings do nevertheless reject a detrimental effect *per se* of being a street child, particularly since the homes of many poor urban children are in themselves physically and psychologically debilitating. Veale

et al., (in press) conclude that the rational choice model which incorporates spatial, temporal, social, dynamic, identity and motivational factors, "switches understanding of street life from 'deviant' behaviour to 'rational' behaviour, emphasising thereby children's self-efficacy and resilience". In attributing rationality to street children, Veale and her colleagues indicate the children's effective mental capacity, a fundamental aspect of well-being.

For street success one must be responsive to the new environment, indeed children can be so responsive that they adopt a new ethos, that of the street sub-culture. This becomes so much part of the child's ethos that few children for example take up opportunities to live with middle class families since "many aspects of these situations are in direct conflict with a street ethos based on spontaneity, insubordination to authority, and solidarity with other deeply rejected young people" (Hecht, 1998:183). To an outsider, incorporation of such beliefs into one's own belief system seems detrimental to well-being. Hecht (1998) found much contradiction in Brazilian children's own feelings about their lifestyle, "Street life is marked by a double ethic of rebellion and remorse. On the one hand, street children tend to be haughty and defiant... but they are torn by a moral conflict over who they are and what they do. Their violence is projected not only outward but inward" (*ibid*:146). Despite street children seeming aware of the consequences of their actions, on occasions their (short term) desires may (consciously) overrule choosing the most successful (to an outsider) or socially accepted behaviour. Baker (1998) argues that if social competence is attributed to street children then they must also be held responsible for any anti-social behaviour in which they partake. Hecht (1998) found the children to be fully aware that some of their actions are "wrong", not only in the eyes of others, but by their own standards. Many of the children Hecht worked with spoke of being helpless to avoid doing bad things, and that in some way the trials in life as a street child were punishment for these wrong doings. Conflicting phenomena of social competence and deviant behaviour within street children points to some level of confusion and anguish, and therefore a potential threat to mental well-being.

Violence is one such "trial" common to street life and of course has major impact upon a person's well-being, both physically from injury, and mentally from its continual threat. Whilst of course, it cannot be assumed that all poor urban households hold within them

regular violence, street children often state violence in the home as one of their initial reasons for approaching street life. Indeed in Brazil street living children, compared to street working children, were found to come not from the poorest families, but from those characterised by higher levels of physical abuse (Rizzini, Rizzini, Muntioz and Galeano, 1992, cited Veale *et al.,* in press). This is so despite the ever present threat of violence on the street from other street youths and from the police. Hecht (1990:67) writes "the ability of children to survive in the streets and to find moments of joy, despite the odds stacked so heavily against them, is testament to their resilient spirit... but it is difficult to be sanguine about the futures of individual street children in North East Brazil. Violence in the street ends the lives of many children". By contrast I found no literature concerning violence in the lives of Ethiopian street children.

Talking about the health of street children, many writers fail to appreciate the major risks to health for most of the urban children in cities of the Majority World. De la Barra (1998:46) begins with the premise that "Being poor is in itself a health hazard; worse, however, is being urban and poor. Much worse is being poor, urban, and a child. But worst of all is being a street child in an urban environment". The life and subsequently health of city children is quite removed from that of rural children. Issues such as air and noise pollution, or exposure to (traffic) accidents affect the whole of the urban population, arguably street children spending the majority of their time on the street are more affected by such phenomena. However in cramped urban slum conditions the difference between street living children and slum dwellers may often only be a fractional, if existent, difference. De la Barra (1998:46) admits that "The division between street children and their urban poor counterparts still living within some sort of family support system cannot be sharply defined", yet goes on to conclude that "Street life has a negative impact on both the mental and physical well-being of the street child" (*ibid*:52). As evidence he cites a study conducted by the Department of Social Welfare (1988) in the Philippines which found high levels of malnutrition and stunting in street children, but had no comparative group data. It is not rare to see writers holding the contested opinion that being a street child is unconditionally bad for a child's well-being. This is despite early findings from researchers such as Aptekar (1988), working in Cali, Colombia, who found that most street children fared adequately, given their poor circumstances in an impoverished country. They found their own benefactors and maintained themselves emotionally and physically at least as well and often better than

their counterparts who stayed at home. Rarely though does research clearly distinguish between street living, street working and poor non-street children, so making it hard to determine how well-being is affected by increasing involvement with street life. This again highlights definitional problems associated with street children.

The importance of relevant comparison groups as control groups for research with street children is highlighted by the social anthropologist Hecht, who in the preface to his book about street children in Recife, Brazil "changes the terms of the debate, asking not why there are so many homeless children in Brazil, but why - given the oppressive alternative of home life in cramped *favela* shacks - there are in fact so few" (1998: preface, italics in original). He points to the positive side of streetism: "in the *favela* there is no room to dream, there are no bright colours, everything is dark. In the street there are bright colours, the children can have fantasies and dreams" (Hecht, 1998:170). In terms of a variety of aspects of well-being, ultimately it appears that, as with most lifestyles, there are advantages and disadvantages to a life on the street. Nevertheless, in a review of street children literature worldwide, Bar-On (1997:70) concludes, "Harsh as their situation is, it is wrong to think of it as invariably miserable or distressed".

2.3. ANTHROPOMETRY - PHYSICAL WELL-BEING

2.3.1. Why measure growth?

Growth status is a widely employed method of assessing the overall health of a population; it is used as a key indicator of past, present and future health. Mascie-Taylor (1991) argues that growth failure is the most characteristic marker of childhood malnutrition. Others extend it to an index of poverty, "we can say with confidence, [stunting] is one of our best measures of social inequalities" (Martorell, Mendoza and Castillo, 1988:68). These authors stress the need to assess children's micro and macro environments, emphasising that growth status is primarily determined by the environment. Micro environmental effects may include household composition, child's sex, age and birth order, while the macro environment includes such variables as seasonality, low food availability and poverty. It is clear that a child's early environment has profound, long-lasting, and often irreversible consequences later in life. In turn growth status is important to well-being because it has serious health implications for

child and adulthood. Poor growth is associated with undernutrition, increased susceptibility to disease (Martorell, 1989, Nabarro, Howard, Cassels, Pant, Wijga and Padfield, 1988), psychosocial impairment (Johnston, Low, de Bassa and McVean, 1987), restricted capacity for physical work, increased risks at childbirth for women, and shorter life expectancy. Beaton (1989:32) warns that "With the proliferation of growth studies, small size has changed from *being a predictor* of an undesirable health outcome to *being* an undesirable outcome" (italics in original). Such a shift is unhelpful and misleading. We must remain mindful that growth status simply *reflects* environmental quality and makes a valuable *tool* for measuring the health implications of children's environments.

Growth status is easily measured, non intrusive and cheap to do, making it ideal for (nutritional) biological anthropology field studies. With knowledge of age, weight and height, individuals can be assessed for stunting (low height-for-age, indicating long term growth retardation), wasting (low weight-for-height, indicating acute growth retardation), and being underweight (low weight-for-age, seen as a general measure of growth retardation). Measures are most commonly made meaningful by standardising for age and sex using z-scores (standard deviations from the median of a reference population). WHO (1986) recommends the use of the NCHS reference curve based on a US sample population, for common usage which facilitates between country comparisons (Hamill, Drizd, Johnson, Reed and Roche, 1977). The NCHS curve does not take ethnic differences in genetic potential into account (i.e. Ethiopian versus Nepali), therefore it is necessary to emphasise that the NCHS data are used as references, rather than standards which imply target growth. Problems of reference curves being inappropriate to use across cultures is less relevant to this study, since all children I measure are compared with each other, using a reference curve that is equally (in)appropriate to all children.

2.3.2. Anthropometric research involving street children

Anthropometry has been employed in quantitative comparative studies of children living in different environmental contexts. Two studies focusing on street children are detailed below, further discussion in the final chapter compares results from previous work and this current study. Firstly, I present a study conducted by Panter-Brick and her

colleagues; this is presented in some detail to put the reader in the picture of the immediate research based background of the Ethiopian study. Panter-Brick, Todd and Baker (1996) compared four groups of Nepali boys aged between 6 and 14; 111 homeless (street living), 62 slum dweller (street working), 82 privileged school (middle class) and 52 village boys. As expected, the schoolboys were taller (less stunted) than any of the other groups ($p<0.0001$), most interestingly though homeless boys were taller than both village boys ($p<0.0002$) and slum dweller boys ($p<0.02$). The village and slum dweller boys were moderately underweight while the homeless and school boys were mildly underweight (weight-for-age). All children but one (homeless) boy had adequate weight-for-height, indicating no wasting. The relative proportion of severely and moderately stunted children differed between groups. Severe and moderate stunting combined were most prevalent in slum dweller boys (84%), followed by village boys (80%), and then homeless boys (66%), with least found in school boys (43%). There was no significant difference in stunting between earlier (0-0.9 year) and later (more than 2 years) arrivals on the street, showing the duration of homelessness to have no significant effect on the children's growth status.

Several explanations were considered, in accounting for the homeless boys' ability to maintain growth status despite a lack of shelter and parental care. The authors point out that the less successful children may have left the streets (either finding employment or returning home), such that the population measured are therefore the "successful" street children. Alternatively, they suggest the possibility of selective out-migration of taller village boys to the streets. The range of foods available to urban children is much wider than the regular monotonous diet of Nepali villagers. Homeless children can control their own consumption within their financial means, in Nepal they spent most of their earnings on food, with their diets including meat and sweets (Baker, Panter-Brick and Todd, 1997). Moreover street children develop coping strategies, through peer networks and arrangements with restaurateurs, for when their own earnings are low. Slum dweller boys generally eat with their families, where poverty often means little food is available. Moreover, energy expenditure may explain the observed growth differences between urban and rural boys, using heart-rate monitoring, as village lifestyle was found to be the most physically arduous (Panter-Brick *et al.*, 1996). An alternative explanation is disease load. In the Nepal study illness was reported more frequently by the homeless children, despite their access to free NGO health care. However village

children showed higher levels of morbidity from blood markers, despite reporting less illness (Panter-Brick, 1998b). "If growth status is accepted as an important indicator of general physical health ... findings suggest that the homeless in Nepal are neither drawn from the most deprived sectors of society, nor join its most deprived sectors upon arrival on the streets" (Panter-Brick *et al.*, 1996:449). It is only through such systematic comparison of different groups of Nepali boys that Panter-Brick and her colleagues were able to reach such conclusions. "In Nepal, homelessness and absence of family support do not necessarily have adverse implications to physical health. The street environment has... positive as well as negative aspects relative to the home environment" (*ibid.*:449).

A similar study in Jakarta (Gross, Landfried and Herman, 1996) has corroborated findings from Nepal. The growth status of 89 street children (79% street working and 21% street living children) and 143 non-working slum dwelling children was assessed for children aged between 8 and 15. It was found that "street children weigh more and are taller than their socio-economic peers" (*ibid.*, 1996:453). 52% of the street children were below the 3rd percentile for height-for-age (stunting), whereas only 7% were below the 3rd percentile for weight-for-height (wasting). Prevalent stunting, they argue, suggests that "the majority of the children came from very poor backgrounds. Due to an inadequate food intake and repeated episodes of diseases during the early years, they did not attain the potential height for their age, thus becoming stunted" (*ibid.*:456). The low wasting suggests that "current quantitative and qualitative food intake or infectious diseases such as diarrhea do not pose a substantial problem in the life of these street children" (*ibid.*:456). This they argue is in part due to the solidarity of street children; if children earn little on a certain day they are generally able to borrow from friends to satisfy their immediate needs.

Gross *et al.* (1996) focus on family disorganisation as an important reason for child neglect, which is associated with whether or not children break contact with their families. However there was no significant correlation between stunting and the persons who were present in the household of the children. They found the mother was more likely to be present in the home of street working children than street living children, suggesting that the relationship of the child with his/her mother is particularly significant. Gross *et al.* also suggest that the differences found between street and non street children may be due to the financial resources being higher for street children

(with or without their families) who also have more coping mechanisms available to them through network support. Without portraying the streets as innocuous, Gross *et al.* suggest that children's work is not negative *per se*, and that it may stimulate the development of positive qualities of personality and leadership more than the poverty conditions at the home left behind. Similarly to the Nepal study, "this study challenges the prevalent, stereotypical assumption that all street children are pitiful, pale and thin, malnourished children" (*ibid.*:457).

2.4. CORTISOL - PHYSIOLOGICAL/PSYCHOSOCIAL WELL-BEING

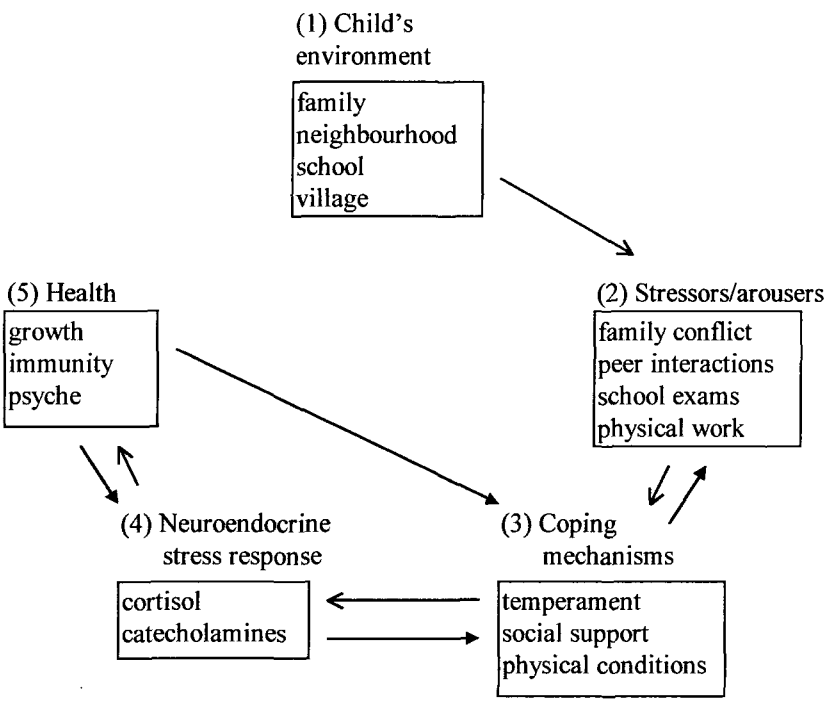
2.4.1. Why measure cortisol?

Understanding of the processes that translate lifestyle into health outcomes may be enhanced by measuring physiological variables. One such biochemical marker is cortisol which is affected by environment, particularly psychosocial environment. Cortisol has been linked to stress (Sapolsky, 1994) or to emotional arousal (both positive or negative) (Pollard, 1995), aspects of well-being. Feeling under pressure, worried and anxious, happy or sad, are important to mental health and to physical health through susceptibility to illness (Sapolsky, 1994). Hormones such as cortisol are important indicators of physical and psychosocial environment. Stress therefore, like growth, is important to well-being *per se*, but more importantly because of its causes and consequences. Stressors as defined by Sapolsky (1994:7) are "anything that throws your body out of homeostatic balance". As such stress is an incredibly broad, flexible and subjective phenomenon ranging from injury and illness, to excessive heat, to arguments or happiness, to love and sex. It is therefore notoriously difficult to measure; cortisol may provide a useful method for assessing stress from a physiological perspective. The relationship between cortisol and stress is not yet fully understood, however already it can complement more traditional methods of measuring stress, such as life events or daily hassles scores, attentional or memory tasks. Cortisol levels were collected in this study in an exploratory fashion to investigate this potential measure of well-being, still novel to research.

Issues of unraveling cortisol and potential associated factors are complex, there is still much to explore and understand yet detailed studies show great potential. The

implications of cortisol variation on well-being, and indeed well-being on cortisol (since the direction of influence is not fully established), have many dimensions, related to stress, experience, temperamental, behavioural and morbidity. Flinn uses cortisol levels as "a useful tool for examining the child's imperfect world and its developmental consequences, especially when accompanied by detailed ethnographic, medical, and psychological information" (1999:106-7). In figure 1 Flinn illustrates some of the possible developmental pathways among a child's environment, stress perception, hormonal response, and health.

Figure 2.1. Relations among childhood environment, stressors, coping mechanisms, hormonal response, and health (taken from Flinn, 1999:107).



2.4.2. What is cortisol?

Cortisol has been described as the "stress hormone" produced in response to physical and psychosocial stress (Sapolsky, 1994). Levine (1983, cited in Sapolsky, 1994) argues that steroid hormones (chemical substances which flow through the blood stream with specific regulatory functions within the body), including cortisol, are frequently found to be affected by averse situations particularly associated with novelty, uncertainty and negative emotions, three factors prominent in stressful events. As a physiological

marker of stress, hormone levels are more objective than traditional psychological or self reported measures and amenable to quantitative analysis; making their significance in cross cultural studies particularly exciting. Nonetheless, the exact correlation of cortisol with such measures is yet unclear. Despite cortisol being an important aspect of the physiological stress response, Pollard (1995:265) argues that "at present it is premature to use cortisol level as a marker of stress". There is a lack of research into variation in cortisol levels in real life contexts which limits the conclusions that can be reached. Pollard (1995:265) suggests that "cortisol level may be as much influenced by positive emotions as by negative emotions usually identified with stress". Toates (1995) indeed is reluctant to consider a kiss as a stressor, despite the similar physiological effects to traditional stressors. Having found that cortisol and adrenaline have distinctly different profiles, Long, Ungpakorn and Harrison (1993, cited in Panter-Brick and Pollard, 1999) argue that different hormones may represent distinct aspects of the stress response. Sapolsky (1994) suggests that particular stressors may have specific "hormonal signatures", and that these may vary between individuals. There is no doubt that biochemicals play a primary role in the stress response and that cortisol is one relevant measure of this response. As cortisol measures any arousal (not just negative stress), I regard cortisol as stress *sensitive* hormone.

The secretion of cortisol is controlled by the hypothalamic-anterior pituitary-adrenal cortex system (known as the HPA axis). The hypothalamus, positioned at the base of the brain, initiates a series of biochemical changes along the HPA axis that govern cortisol levels. Corticotropin releasing factor (CRF) is secreted by the hypothalamus, CRF in turn triggers the release of adrenocorticotrophic hormone (ACTH) from the anterior pituitary. ACTH is transmitted through the blood stream to the adrenal gland which releases glucorticoid (cortisol). Cortisol is secreted in pulses, the number of which determine cortisol levels (Pollard, 1995). Negative feedback occurs with cortisol inhibiting the release of ACTH (Hadley, 1988, cited in Pollard, 1995). Cortisol levels follow a circadian rhythm, peaking around waking time in the morning and with the lowest values around midnight (Flinn, 1999). This pattern is of course be altered by specific events within daily activity which result in the secretion of cortisol to produce higher levels.

Cortisol modulates a variety of somatic functions to allow an immediate response by the body to changing environmental situations. Short term mental and physical preparedness against a psychosocial or physical challenges is gained at the expense of ongoing physiological development (Flinn and England, 1997). "Cortisol response can be viewed as an adaptive mechanism to re-allocate energy resources in the body, in response to changing environmental conditions, with significant consequences for health in terms of physical and psychological development" (Panter-Brick, 1998a:92).

Recent developments in analysis of salivary cortisol has allowed research into childhood stress in naturalistic settings, a field well suited to anthropological study (Panter-Brick and Pollard, 1998). Cortisol is not necessarily stable even over relatively short periods of time; salivary and blood cortisol levels are measures of an instant level of cortisol unlike urinary measures which provide cumulative measures over several hours (Pollard, 1995). In saliva, cortisol peaks 20-30 minutes after a stressor is experienced (as measured in laboratory conditions), and has a half live of one hour (Kirschbaum and Hellhammer, 1989). Once collected and treated with preservative, salivary cortisol can be stored for up to 6 months at room temperature before laboratory analysis.

2.4.3. Cortisol studies with children

Research into cortisol, as one endocrine measure of stress, and its variation within individuals, is not altogether new, yet to date comparatively little work has involved children, particularly children in the Majority World. Panter-Brick and Pollard (1999) review the work on endocrine variation in terms of work environments including, as that relevant to children; school attendance (in the Western and Majority world) and street work (in Nepal). They argue that "endocrine data offers real potential for providing insight into the impact of working behaviour on health and well-being" (*ibid.*:2), or indeed the impact that behaviour or lifestyle has upon health and (physiological) well-being. A substantial amount of hormonal research involving a broad range of populations and tasks has been undertaken, together it provides a clear picture that everyday experience is reflected in hormone levels.

The cortisol research to date covers two aspects; firstly external variables such as physical activity, environmental and psychosocial stressors; and secondly internal

variables such as temperament and individual past experience. The most comprehensive studies combine these strands as, to some extent, do studies assessing the impact of past and present environment on cortisol. On the methodological level, two approaches can be taken. One measures mean or median cortisol during regular daily activity to determine an individual's cortisol level. The other establishes cortisol reactivity, either by measuring the variation in a number of samples during daily activity or by measuring cortisol level before and after a stress inducing natural event or experimental procedure.

I begin by summarising one particular study linking growth status to cortisol. This is followed by discussing two studies conducted in the Majority world which are of direct relevance to this research. I later discuss briefly research into the impact on cortisol of school attendance. All research highlights the importance of individual differences (psychological, social and past experience) in mediating the impact of context on cortisol. These themes are picked up further in the discussion chapter.

2.4.3a. Growth status and cortisol

Notable here due to its relation to growth status is Fernald and McGregor's work (1998) testing the hypothesis that children with early growth retardation have different stress responses than adequately nourished children. There were 30 chronically stunted children (at 6-24 months, stunted children had a height-for-age z-score of between –1.5 and -2, and at the time of the study they had a z-score of below -1.5) and 24 control children (height-for-age z-scores always above -1). The children, aged 8-10 years, came from the same poor neighborhood of Kingston, Jamaica. Cortisol (at three points during the test session), heart rate monitoring and observed behaviour were measured during a test session of 6 tasks of varying experimentally induced physical and stress levels. Stunted children had significantly higher cortisol levels at the end of the test session, suggesting an increased responsiveness in stunted children to the cumulative effects of psychological stressors. There was an interaction between growth status and personality inhibition (measured through vocalisation level in the interview test), with cortisol levels negatively correlated with vocalizations ($r=-0.55$) for stunted children but positively correlated for non-stunted children ($r=0.58$). Stunted children were more inhibited and less happy during the interview tasks, and less attentive on the frustration task, than the control group. Fernald and McGregor conclude that "physiological and behavioural

results support the hypothesis that the HPA [hyperthalamic-pitutary axis] axis and SNS [sympathetic nervous system] in stunted children may have undergone alteration during development" (*ibid.*:7). However, the association between stunting and cortisol was not replicated in a pilot study in Nepal (Fernald, in prep).

2.4.3b. Ethnographic studies of cortisol

Flinn and his colleagues have coordinated the most comprehensive study of cortisol variation in a natural setting as part of an ongoing study in a Caribbean village (Flinn and England, 1995; Flinn, Quinlan, Decker, Turner and England, 1996; Flinn and England, 1997; Flinn, 1999). In 10 months fieldwork, over a 10 year period (1988-97), 22,438 saliva samples have been collected, and analysed in relation to individual child and ethnographic setting data. 247 children from 82 households (aged 2 months to 18 years) took part in the study. The majority of the saliva samples were collected by walking a route around the village twice each day, other samples came from hourly sampling of the same child during a "focal follow". Flinn's main investigation to date is related to the impact of household composition on cortisol profiles, in the short and long term. Stability in environment and care during infancy and early childhood are important for optimal child development (Bowlby, 1969, cited in Flinn, 1995). Consequently, Flinn argues that the human mind is likely to have developed special sensitivity, particularly during the vulnerable periods of infancy and early childhood, to interactions with caretakers and the psychosocial dynamics of the family.

Flinn found that children who lived with step fathers, distant relatives or single mothers without kin have higher cortisol than those living with both parents, single parents with kin or grandparents. In particular children living with step siblings show unusual profiles and inhibited temperaments compared to their half sibs within the same household. Children living in stable intensive families showed moderate profiles. The particular pattern in unusual profiles varies and Flinn suggests may be due to the type of family, perceived environment, coping abilities, temperament and frequency of positive (affection) and negative (argument) affect. It is important to appreciate that no uniform relationship between cortisol and household composition has been identified. Children may be sensitive to specific aspects within the family environment of which household composition can only be an indicator. Flinn found that when a mother has little or no

spouse or kin support, there is a greatest risk for children to have abnormal cortisol profiles. It is maternal care which appears to be the most significant aspect of household composition, perhaps because this is most strongly associated with security of attachment, and availability and intensity of caretaking attention.

Flinn also investigated the profiles of individual children to identify particular household events that may allow a clearer understanding of what it is within the variation of household composition that affects cortisol levels. Children's cortisol levels were elevated after marital discord. Mother's absence resulted in elevated cortisol profiles for all children, however father's absence (unless for lengthy period) only affected boys. Moderate positive arousal events/stressors, such as playing, eating and family member returning home, were found to increase cortisol levels by 10-100%. Whilst negative arousal events, such as family conflict or change, increased cortisol by 100-2000%. Calm and affectionate contact was found to reduce cortisol levels by 10-50%. Analysis with reference to daily events showed that 19% of all rises in cortisol above 2 standard deviations from the mean are temporally (within 24 hours) related to traumatic family events and 42% of traumatic events are temporally associated with a rise of more than 2 standard deviations in cortisol above the mean. Of all the factors studied, traumatic family events were found to be the most associated with cortisol levels and, "unlike their responses to many other potential stressors, most children did not seem to habituate readily to family trauma" (Flinn, 1999:123). However since data collection was completed at home, and therefore during periods of intense family interaction, this association may be exaggerated. Flinn also notes that children in difficult family environments do not all, and do not always have, elevated cortisol levels, nor is family composition always a good indicator of difficult family environment. Mediating factors such as other kin support or parental temperament, regularity of affection are all important. Nonetheless Flinn argues that these factors do not invalidate the general association between household composition and child cortisol levels. Instead they indicate the complexity of cortisol responses. Thus conclusions boil down to some stressed children showing one pattern whilst others show another.

Flinn and colleagues (1995, 1997, 1999) include vignettes to illustrate the importance of analysing profiles using detailed knowledge of the individual child, their lives and daily activity. Polly (aged 9), who lives with her aunt (her mother lives and works elsewhere)

showed elevated cortisol for two days following being scolded by her aunt and was ill four days later. When Polly moved to her great-grandparents house, her cortisol level fell and she was seen more often to be happy (Flinn and England, 1995). Jenny (aged 12) lived with her grandparents, aunt and uncle, following being scolded (she felt) unfairly, her afternoon cortisol level was elevated with sub-normal levels the following day. This may represent a low recovery period resulting in overall cortisol level not being higher; as such this may not have negative effect from energy reallocation. She was ill three days later (Flinn and England, 1997; Flinn, 1999).

Flinn's other findings include a health deterioration (17% above baseline for morbidity) temporarily after a stressful incident, 31% after cortisol response and 82% if both. Morbidity has a lag of 3-5 days, returning to baseline after one week. This may not be a direct result of increased cortisol but instead due to the immunosuppressive effect of stress, and increase in pathogens in a tense environment or a decrease in sleep (commonly associated with stress).

I now move to research with street children. Specific research on street children's cortisol is, to date, unique to one study in Nepal, as part of the research project which has been detailed earlier in terms of anthropometric data. Panter-Brick and her colleagues employed salivary cortisol measures as one of many health indicators (in Panter-Brick and Pollard, 1999). The study compared 10 to 14 year old boys who also took part in the growth study from four socio-economic and urban/rural contexts (27 urban homeless, 20 slum dwellers, 30 privileged school boys and 30 rural village boys). Average morning cortisol values (from 753 samples) were low for all groups (0.18-0.27μg/dL) for between 1.5 and 2 hours after waking, compared to the published range (0.23-0.66μg/dL). Nevertheless values were similar to findings from the Caribbean of 0.22μg/dL after two hours of waking (Flinn and England, 1997). Mean morning levels were higher for both urban homeless (0.27 ± 0.08 μg/dL) and school boys (0.24 ± 0.08 μg/dL) relative to either slum dwelling (0.18 ± 0.06 μg/dL) or village children (0.18 ± 0.07 μg/dL). Afternoon values showed no group differences. The homeless boys show low cortisol variance relative to boys living at home. This might indicate a blunted response to stress since they appear to have an increased arousal threshold to day-to-day circumstances and subnormal levels when not in stressful situations, be due to habituation to the hazards of street life or effective behavioural strategies to cope with

homelessness. Panter-Brick and Pollard (1998) also use vignettes to demonstrate the value of detailed knowledge of children's lives needed to shed the most light on cortisol variation. Two homeless boys were threatened with violence by a gang unless they gave them money, the next time they met the two boys had no money to give. One boy was injured by the gang, his cortisol level remained elevated for several days despite him not initially reporting the incident. The other ran away from the gang and his cortisol remained low but with no normal diurnal variation suggesting a possible down regulation of the HPA axis (Panter-Brick and Pollard, 1999).

2.4.3c. School, cortisol and mediating factors

As might be expected, studies relating school attendance, as a normative stressor, to cortisol (as a hormonal marker of stress) have not produced clear results. School is seen as a "universal childhood stressor, involving cognitive, emotional and interpersonal challenges" (Boyce, Adams, Tscharin, Cohen, Wara and Gunnar, 1995:1010). Research in different schools, with children who have different temperaments and experiences inevitably produce inconsistent results. This demands that research go beyond school attendance *per se* to temperamental and behavioural factors, and the psychosocial meanings assigned by children at an individual and cultural level to activities. The complexity in this field can be demonstrated by noting some of the findings to date reviewed in Panter-Brick and Pollard (1999) along with the respective explanations presented.

A study in an Oxford school (n=37, age 4-9), found cortisol to be higher on a home day than a school day (Long, Ungpahorn and Harrison, 1993). The authors argue that this results from school providing a comparatively structured and predictable environment with little negative effect, while the home environment is characterized by stimulation but relative uncertainty in social interaction. A similar finding in a Swedish day care centre (n=60, age 4 to 7) was interpreted "as an indication of "positive stress" at the daycare centers, induced by stimulating activities, interaction with other children, etc" (Lundberg, Rasch and Westermark, 1991:154). In the U.S. too Gunnar, Tout, de Haan, Pierce and Stansbury (1997) found mean home cortisol to be higher than school (n=46, age 5-7); they suggest this is because the children are pleased to be among friends at school.

Spangler (1995) found no overall cortisol differences between home and school days in German school children (#=20, age 6). Spangler proposed that this was because either going to school is not sufficiently stressful to cause differences, or habituation to school may have occurred. Interestingly Spangler found instead that cortisol patterns were affected by behaviour and temperament. Children with type A dispositions (aggressiveness, competitiveness and impatience), especially those with non-optimal school performances had lower morning cortisol values. Cortisol variation within a day was significantly higher for children with school related problems and type A behaviour. Such findings indicate the importance of mediating factors on the impact of context on cortisol. They help highlight the importance of individual differences in social competence, behaviour and temperament, on cortisol results suggesting children should be seen as active agents in challenging situations.

Within a much larger project in the Majority World Durbrow, Gunnar, Bozoky, Adam, Jimerson and Chen (in press) studied 84 school going children aged 5 to 12 in a Caribbean village. 80% of the children had higher cortisol levels at school than at home; even older children more familiar with the school environment. This contradicted their own hypothesis that since children are quite used to wondering in new environments and have routines both at home and at school, there would be no difference in home and school cortisol levels. Using peer assessment some evidence to support the influence of personal characteristics on cortisol was found. The amount of cortisol elevation at school was positively correlated with proneness to fight ($r=0.24$, $p<0.05$) and negatively correlated with nomination as a best friend ($r=-0.25$, $p<0.05$), however cortisol levels were unrelated to measures of anxiety, attention problems and peer relations. For children with inattention or internalizing problems, particularly high levels of cortisol at school relative to home were associated with poorer academic performance. Durbrow *et al.* suggest that behaviours associated with poor academic performance (i.e. being late or poorly prepared) may result in higher cortisol levels because of the threat of punishment.

The range of findings across these studies reflect the variables measured and the specific context within which research was undertaken. In some situations school can be viewed as a positive stressor, in others it is not. This is influenced largely by temperamental

factors, whether children have the social competency skills to cope the interactions school brings and the kind of school within which the research is undertaken. It must be remembered that since different methodologies are employed between studies, finding no association between cortisol level and/or reactivity and other variables may reflect inappropriate testing procedures of either variable. Notably the studies mentioned have not attempted to identify any particular aspects of home life that may alter the cortisol pattern between children. Ultimately, studies are hampered not only by circadian rhythm, but by numerous factors being of potential importance (e.g. morbidity). The impact that individual differences have upon cortisol clearly indicates the dangers of making superficial comparisons between broad contextual situations, without the knowledge of specific contextual factors or finer individual variables, to appreciate cortisol profiles as dynamic and complex outcome variables.

Chapter 3 - Fieldwork Methods

Fieldwork was conducted from August 1997 to February 1998. The first two months were spent familiarising myself with Addis Ababa, learning Amharic, affiliating with Addis Ababa University and obtaining a Resident Permit. I made many contacts within the university and NGO communities and became familiar with Ethiopian literature about street children. Towards the end of this period I recruited and trained two research assistants and made specific arrangements to begin the first phase of the research. Considerable time was spent with different groups of children in various contexts. During October and November 1997 phase one of the research was conducted. In December 1997 phase two was prepared and begun, this was completed in January 1998. In February focus group discussions were arranged and some completed. The total cost of fieldwork was approximately £3,100, with laboratory cost for cortisol analysis at £960 plus expenses (£160), reaching a study total of £4,220 (appendix A.1.1 shows a breakdown of expenses).

I follow advice from Kuale (1986) that "because of all the difficulties associated with studying street children, it is helpful to give the reader a heuristic analysis of the data. Such analysis gives logical arguments about how the data were collected and what was done to overcome methodological problems" (cited in Aptekar, 1994:203). This chapter describes my fieldwork, detailing not only the methods employed but discussing too the background to the methods and issues concerning the context in which I was working.

3.1. Selection of Participant Children

The intention on leaving the UK had been to compare street children with a control group of poor urban school children. Once in Ethiopia, it was clear that such categories would result in overlooking a considerable amount of potentially relevant lifestyle data. Indeed many street children in Addis Ababa *are* urban school children. The only feasible way to conduct this study, recognising limitations (most notably in time, language ability and not being Ethiopian) was to use a number of research sites targeting different social groups. These concrete locations were intended to serve as organisations and institutions from which children could be recruited for the study and as centres where

the research would be conducted. During my first few weeks in Addis I visited many NGOs and schools as potential research sites, and gathered advice from appropriate staff. This was largely facilitated by staff from University College Cork's (UCC) field research centre in Addis Ababa, and in particular Firew Kefyalew, through contact with Dr Angela Veale.

Four sites were selected to fulfill the requirements of this research as follows: represent different lifestyles; facilitate fieldwork in terms of space to work; include children seemingly willing to participate in the study; have cooperative staff; and, the location be easily accessible from the main centers of the city; additionally little, if any, research had previously been conducted at any site. Research conducted to date into cortisol variation, and for that matter growth status, suggests a more useful contribution to this field of study should be able to offer specific details of lifestyle. The methodology employed would primarily allow the children to be assigned into four lifestyle groups (somewhat different to the four geographical sites) for analysis. These were street living, street working, poor non street and middle class children. Together they reflect more accurately the continuum of children's lifestyles within Addis Ababa than the geographical sites *per se*. Ethnographic data from structured interviews provides potential for deeper analysis according to specific dimensions within the children's lifestyles.

3.1.1. GOAL Ireland - Street NGO

One of the sites chosen was GOAL Ireland, this NGO caters mainly for "hard-core" street children. In September 1997, with the NGO then 3 years old, 380 children were registered. Through a drop-in centre, GOAL's activities comprise non-formal education, counseling and guidance, play and recreation opportunities, health services, washing facilities, a library and subsidized meals. In addition approximately 80 children were supported to attend school or complete vocational training; these children and young people were provided with a home in one of the four supervised shelters. GOAL aims to target *street living children*, namely those who live and work on the street. Based at the *kebele* (local community) administrative centre, GOAL has been very successful in increasing community and employers' understanding of street children's lives. A high emphasis is placed on advocacy work within the community because it

aims, as most street children focused organizations in Addis Ababa do, to reintegrate its beneficiaries into society. GOAL Ireland is referred to as the "street NGO", as its work is specifically targeted at *street living children.*

3.1.2. The Rehabilitation and Preventative Project for Street Children (Mobile Unit) – Community NGO

As its official name suggests, the Mobile Unit focuses on preventing children progress further towards more involvement in street life. Set up in 1989 and now jointly funded by the Ministry of Labour and Social Affairs (MOLSA) and Italian Cooperation, Mobile Unit works through five drop-in centers within Addis Ababa. These provide places where children can play, join in with activities, receive guidance and counseling, or simply hang around in safety. Mobile Unit runs a non-formal education program, has recreational facilities, health services (although due to financial constraints the nurse's contract was not renewed in January 1998) and (though somewhat sporadically) provides vocational training in leatherwork, bamboowork and carpentry.

Street living children are supported by the centre, nevertheless, the majority of the children present at this centre (800 of the total 1,000 beneficiaries) are *street working children*, namely those who spend much of their time on the street away from adult supervision, returning home to their family most nights. Some children use the centre who do not work on the street but come from the surrounding deprived area. Mobile Unit believes that the longer children are exposed to street life, the more likely it is that they are drawn into delinquent activities associated with the street. A strong emphasis is therefore placed on family support and much work takes place within the community to prevent children of the most destitute of families from initially joining the streets or thereafter progressing from working involvement with the street to becoming *street living children.* The majority of the children attend school, in part, because the organisation's philosophy demands the constant reinforcement of the value of education. Mobile Unit is referred to as the "community NGO" because its activities do not exclude *non-street working children.*

3.1.3. Menelik school – Government school

This is a government school incorporating grades 1-7. The school is free and the pupils come mainly from the immediate vicinity. In Ethiopia classes often consist of children of quite varied ages because pupils only advance a grade if they pass the end of year exams (and themselves or their family can afford to buy educational materials). Government schools in Ethiopia run on a shift system, with the pupils attending either morning or afternoon classes. This creates potential overlap between field sites particularly with the community NGO, in terms of lifestyle similarities. Many of the children recruited at Menelik school were free to work on the street for half of the day. Whether working children or not, these children come from poor backgrounds, sometimes desperately poor.

3.1.4. Magic Carpet school – Private school

This is a fee paying private school costing 80 Birr (£8.00) per month (figures for 1997/98). Education is in English medium and the school day runs from 8.00 a.m. to 3.30 p.m. All the pupils here can be easily identified as *middle class children* both from their parents' occupations and from their own appearance. They are not at risk from poverty and have always had their fundamental basic needs, such as food, shelter and hygiene, met. Their quality of life is high (very high for Ethiopia) with most coming from intact nuclear families with material privileges such as televisions, videos and telephones.

3.2. Research assistants

During the fieldwork three research assistants worked with me. Habtamu was recommended to me by the Department of Psychology at Addis Ababa University, from where he held a Masters degree in Research Methods. He helped with the preparation of the first phase of the research in terms of arrangements with the sites and the development of the structured interview. During the research he was responsible for conducting the structured interviews with the children. Bianche, a second research assistant, was a grade 12 student. She assisted me with the anthropometric measurements throughout the first phase of the research;

When the second phase had been prepared, Habtamu was conducting research elsewhere in Ethiopia, I therefore began working with a third research assistant, Sintayehu. He normally worked at a government children's home, but was looking for research experience to complete during his month's annual leave. He was very conscientious and appeared to form easy trustful relationships with the children. Sintayehu conducted the second phase at the street NGO and both schools, with Habtamu returning to Addis Ababa and conducting this research at the community NGO. Using two research assistants to collect data later to be compared is not ideal and may have led to slight discrepancies on daily activity data between the researchers. However the final analysis of activity for current analysis has been undertaken on much abstracted data, and I am confident this will not have a great impact on the results of this thesis.

3.3. PARTICIPANTS AND GIFTS

The payment of research participants is frowned upon by many anthropologists as it is thought to influence participants and therefore undermine the validity of the research. This is not a qualm held by all social scientists. Where more quantitative, and therefore often more objective, measurements are being used, potential for biases caused by payment are limited. In my experience, in biological anthropology, all researchers have rewarded (not paid) their participants. The most frequent reason for not paying research participants, I suspect, lies in the low budgets of research projects. *Anthropology Today* has recently (December 1997) raised the issue of gift relations between ethnographers and their hosts, (particularly) in poorer countries. It asked more questions than gave answers, aiming to initiate what is an interesting and useful debate. Kingston, one of the editors, asks "Can any general guidelines be proposed to researchers, or must everyone simply accept that moral problems of this kind are inherent in our divided world?" (p27).

In Ethiopia, surrounded by abject poverty, in a country where the minimum adult daily wage is 5 Birr (equivalent approximately to 50p in 1997/98), even small amounts make considerable difference to the income of a family or individual. Is it therefore more justifiable, in such circumstances to help the children after they have effectively helped you, the researcher, indeed can it be justifiable not to?

Each of the children who participated in the study received gifts for their help, except for those involved in the first phase at the private school. In all cases the gifts were deemed appropriate by staff at each site. In the pilot study the government school children were each given two exercise books. The community NGO children were given a minimal sum of money (4 Birr, then approximately equal to 40p, a comfortable amount for a day's worth of food); This compensated (generously) for that lost in earnings during the time the child spent in the study. For the first phase, it was initially planned to give the NGO children a gift of highest nominal value; however once the level of poverty existing in the government school children was established, this seemed improper as these children seemed equally needy. The value of the gifts given at all three disadvantaged sites for the first phase was 5 Birr (approximately 50p). At the government school, the children received educational materials (two exercise books and a pen), as advised by the deputy director. The children at the community NGO were given 5 Birr in cash, encouragement to spend it on educational materials or place it in the savings scheme was largely ignored. At the street NGO the money was put into the saving scheme for each child (except 6 children who were not registered beneficiaries of the NGO and therefore were given the sum in full immediately). The NGO staff decided to allow the children some money to spend as they wished, the remainder was to be saved or only spent by each child on subsistence such as paying for educational materials, meals or rent through the NGO. The children at the private school were not given anything material for the first phase; the children themselves were not in need of anything, and it was feared they (or their parents) may have found the nominal sum that was within the research budget insulting.

For the second phase, a larger sum (10 Birr, then approximately equal to £1, enough for a cheap pair of trousers) was given to each child at the government school and the two NGOs at end of the 7 days of the study. A small party was organised as a thank you to the children who took part in the second phase at the private school.

Being asked for money by children in Ethiopia, and specifically at the NGOs where I was working, was daily a heart wrenching experience. One cannot quibble with the children's assumption that as a *ferenj* (lit. 'Franks' meaning foreigner, Westerner, white man) I was wealthier than they. Equally it is hard to accept that in giving, if asked because of being *ferenj*, you may be reinforcing ideas of Western paternalism and Third

World dependency at an individual level. Alms giving is part of the Christian Orthodox and Muslim religion, it is common to see Ethiopians give either food or money to the needy, especially on holy days. Nevertheless comments that beggars, particularly healthy adolescents, should find a job are also frequently heard. Daily whilst walking the streets *ferenji* are continually asked for money by children, adult beggars, and indeed relatively well dressed young men. I did not leave Ethiopia having learnt how to deal with this, either practically or mentally. At the NGO centres *ferenj* targeting was less obvious, I often saw the children asking other staff for loose change, sometimes for a specific reason (a bread roll or a bus fare), sometimes for no reason at all. I too was asked, because I was there and there was a chance that I might give. Like the staff who sometimes gave a little, though rarely more than 20 cents (then approximately 2p, enough for a bread roll), I sometimes gave and sometimes did not. When surrounded by children I tried to explain that I could not give to the one person asking without giving to all. This idea of fairness was not a concept that the children appeared to appreciate; they knew the hard way that life is not fair.

Requests for money were ceaseless and impossible to satisfy, making them possible at times to refuse. Requests for immediate help from the children involved in the study were different, particularly the second phase during which I came to know the children on an individual level quite well. As a researcher, with adequate monetary means, working with poor and often vulnerable children, one cannot but take some responsibility for the children's needs during the time of fieldwork. One such example involved a boy named Binian at the community NGO. During the second phase one of the questions asked was whether the child was experiencing any health problems that day, Binian had complained about having a sore eye for two days. On the second afternoon he was talking to me specifically about it, I asked him what he thought he should do. He replied that he would have gone to the NGO nurse, but the clinic was no longer open due to limited funds of the NGO. He wanted to go to the clinic but did not have the money. He did not specifically ask me to help him (though it may have been his intention). When I offered to accompany him to a clinic and pay whatever was necessary, he seemed immediately surprised and happy. I suspect that the attention as much as the treatment and medicine received was appreciated. Three days later he was no longer complaining about his eye. The entire exercise cost 29 Birr (then

approximately £2.90 - more than Binian generally spends in a week, or the cost of a burger and coke at a Westernised bar in Addis).

Bemak (1996) writes that researchers should be "social change agents" contributing to improvements in the lives of the street children. This research was not action orientated and would not benefit the children involved; indeed it may not indirectly benefit any children. With such knowledge, and no doubt to allay some guilt for being *ferenj*, I felt justified in rewarding the children for their participation and help in the study. I was grateful to be in a position to help children in situations such as Binian's. I was keenly aware that often more than anything concrete, it was merely my attention that the children wanted, this I gave as freely as possible. It was through such shared moments that I came to understand a little of the children's games, happiness, worries and lives.

3.4. ETHNOGRAPHIC DATA COLLECTION METHODS

This study aims to produce a picture of biological indicators of well-being, and make use of basic social data to examine differences between children more carefully. Keenly aware that the sites do not form valid or discrete categories, a highly structured interview (protocol) was devised to gain information to more truly reflect the children's lifestyles at an individual level. This data was used to assign the children into lifestyle groups and allow the testing of other factors against well-being measures. The interview covered lifestyle factors of potential interest to the study and took into consideration previous finding from NGO and governmental studies of street children in Addis Ababa. Advice was sought about its construction from NGO and school staff, members of the Psychology department at Addis Ababa University.

There is much literature criticising the use of questionnaires in research, emphasising the inaccuracies in the results obtained. Kefyalew (1996:203) points out that questionnaires are often simply adopted with little modifications from previous studies "As a result, the input from the target group for the research - the child - tends to entail, at best, responding to leading, probing and hypothetical questions or, at worst, passive and careless responses to irrelevant questions". Aptekar's (1988:120) criticism is stronger: "Unfortunately, the majority of information about groups of street children comes from the easier method of giving questionnaires that merely assume that what the children say

about themselves is true. We find such an assumption to be invalid". Bemak (1996) speaks of the street children's "well rehearsed untruths" and manipulation of their stories for their own desires as indicators of their internal locus of control (i.e. beliefs that they themselves control their lives). Ennew and Connoly (1996:140) criticise surveys "especially as the only method used, or without control groups".

The current research included control groups and employed other methods besides questionnaires. Data were cross checked where possible outside the context of the structured interview; with NGO staff, the NGO records, the children themselves and other children. In designing the research I was aware of limitations in interview methods, I discussed in some detail with the research assistants and NGO staff the problems of gaining accurate social information about the children's lives. A structured interview seemed the only way to get such data at an individual level, within the time and resources available. Efforts were made with the structure interview to minimise lies and bias; for example, the children were told that the research was not part of a potential aid giving project. Issues such as social deviant behaviour, drug use and sex, though commonly reported by street children were purposefully not tackled. Although not irrelevant to issues of well-being, it was felt unnecessary and since I lacked experience to deal with these issues, unethical. Participant observation may have produced deeper understanding, however due to time limits and language ability, as well as the more quantitative nature of the study participant observation was not considered appropriate as the main method of concrete ethnographic data collection at an individual level.

Interview data is an area of potential error, a factor that cannot be disregarded. Even is such data is correct it is generally shallow. For example, a child's family background may be known but, except for family support ratings, nothing is known about the quality of the family relationships or the child's perception of them. Focus group discussions were well received by the children, and both enjoyable and interesting for the researchers. Such social data are peripheral the scope of analysis in this project, but bring an awareness of the plurality of childhoods for street children. Lastly I note that Lucchini (1996) highlights that the use of anecdotal testimony ascribed to street children when decontextualised is error-bound. Due to the short fieldwork period I try to avoid this, especially concerning issues about which I cannot claim to understand the

children's perceptions enough to truly understand the meaning of their (translated) words.

3.5. PILOT STUDY

A pilot study was conducted in early November 1997 with 8 girls and 8 boys from two sites (the community NGO and government school), making 32 children in total (10% of the target number for the first phase of the research). All children measured throughout the research were aged between 8 and 14 years old; where possible an equal distribution of children within the age range was taken. UNICEF uses 15 as the upper age limit of childhood; here 14 is used to avoid increasing effects of puberty on growth. No average age figure for puberty, as indicated by menarche, was available for Ethiopia, however in Sudan (Khartoum) better off children reach puberty at 13 and poorer children at 14 years of age (Attallah *et al.*, 1983, cited in Eveleth and Tanner, 1976:164). This age range also makes the data easily comparable with that from Nepal where the children's ages ranged 6 to 14. Nonetheless, I acknowledge that the choice of age group almost certainly incorporated adolescents and it is therefore likely that some of the sample would have started the pubertal growth spurt which may have influenced the results. It was impractical to include all sites in the pilot study but important to include one NGO and one school site so as to test the feasibility of the structured interview in each setting and to give myself and the researcher assistants experience of working with a range of children.

The pilot study acted as training for the researchers and allowed alterations to the structured interview in specific questions, in the layout of the data collection sheet and in the manner and sequence of its delivery. Following the pilot study the length of the ethnographic structured interview (appendix A.1.2) was reduced to an average length of 10 to 15 minutes per child. This was the approximate time needed per child for the anthropometric measurements. We were able to confirm that a scale using 5 circles of increasing size drawn on a sheet of A4 paper (appendix A.1.3) was an understandable and appropriate method to allow us to assess children's feelings regarding a variety of topics (five in total). For example we wanted to know how nervous the child felt about the study, it was explained that the largest circle represented feeling very worried (score 5), the smallest represented a child who was not at all worried (score 1). The child was

asked to point to the circle which most represented how nervous he/she was feeling at the time about the study. From the pilot study, it was evident that the children were not concerned about giving saliva; they readily accepted the procedure and found it rather amusing. The time taken to spit varied between one and ten minutes, there was no pressure placed on the children in terms of time. Outside the measuring sessions, "spitting" became a frequent conversation topic with those who had taken part and those who had simply heard about the research. By contrast, the children were initially a little nervous about the calipers used to measure skinfolds, however once they were allowed time to play with them themselves, these fears were allayed.

As the aim of the pilot study was to provide experience for the researchers and given that in field conditions analysis of the data beyond superficial editing was impossible at the time, data gathered during the pilot study have not been analysed.

3.6. PHASE ONE

3.6.1. Methodology

320 children (80 at each site) aged 8 to 14 were measured and interviewed using the procedure detailed below. This was as a feasible number according to staff at each site and an adequately large sample for the research purposes, in fact twice as large as had been planned from Britain. 40 girls and 40 boys were measured at each site, except for the street NGO, where 60 boys and 20 girls took part. Being unable to recruit enough girls was a problem I had envisaged since, as previously mentioned, the majority of street living children are male.

The research was carried out first at the government school, then the private school, the community NGO, and finally the street NGO. It was conducted in this order for practical reasons and to comply with the wishes of the staff, concerned with exams and holidays at the schools. Informed consent was sought from all children and, where possible, their adult caretakers. Care was taken to ensure that all members of participating communities understood the purposes of the research, the uses to which the data would be put, and most importantly what the project could not do for them (i.e. it was not a development project, and would not provide medical or economic aid).

Practicalities at each site individually are described in the order that the research was conducted. At the government school the deputy director arranged for children of appropriate ages to take part in the study. They were sent for from class during school hours. Missing lesson time was the only way the deputy director saw feasible for the study. The research was conducted in a room adjoining the school nurse's office. At the private school the children's ages correspond more strictly to their grade. A certain number of children from each relevant grade were selected from all those who volunteered to take part. Class time here too was missed, but I felt the study to be more rewarding for these children who were able to communicate with me directly in English about the study. The research was conducted in a tin room located at the edge of the playground which served as the science laboratory. At the community NGO a street facilitator, Sade (an older street boy recommended as reliable by staff at the center) recruited the children. He was able to gain the children's support and ensure that the children were of the required age range. The research was conducted in a metal transport container which served as a meeting room within the organisation's compound. At the street NGO, staff facilitated the research by sending appropriately aged children to us, often going far out of their way to help. Initially we used the nurse's clinic, a room within the compound at the street NGO, we were later moved to a rather noisy partitioned room within the main activity hall of the centre.

Although the practicalities did vary a little between sites, actual methods were consistent. The data collected and the overall methodology used at each site were as follows. The research was conducted in Amharic by myself and two research assistants (I had sufficient Amharic to gain the children's cooperation during anthropometry measurements). Four children were invited into the room. The purpose of the research and the form it would take was briefly explained to them. They were then all given the opportunity to leave if they did not wish to take part and told that they were free to leave at any point if they so wished. Their names were entered into a log book which provided a corresponding ID number for each child, this ensured that the actual data remained anonymous, but that for future reference (i.e. to help ensure that children were not measured twice, or if any data was later found to be missing) the child could be identified by the researchers. The children were given a cup of water and asked to rinse their mouths out. They were given a 3 cm square piece of Parafilm® to chew on to

facilitate saliva production. They were asked to fill a 4 ml polystyrene vial with saliva which, once approximately ¾ full, was capped, labeled with ID number, sex, date and time, and sealed with a second square of Parafilm®. The vials had been pre-treated in the UK with sodium azide (a preservative) in accordance with Ellison (1988) who found that steroids in saliva with 0.01% sodium azide showed no significant change in concentration if left at room temperature for up to 6 months.

Two children then took part in the structured interview about the children's lifestyle conducted by Habtamu. It was decided to complete this in sets of two pairs to reduce the children's anxiety and the time taken; from Habtamu's observations during the pilot study we felt confident that this did not interfere with the children's responses. The interview was conducted in Amharic with the responses being completed directly into English on the data collection sheet (appendix A.1.4). Having four children in the study room at any one time proved to be beneficial both in terms of time management and in terms of reassurance for the children. Indeed where possible we found it beneficial to invite the following group of four children into the research room to begin giving saliva 5-10 minutes before we had completed the structured interviews and anthropometric measurements with the previous group of four. This allowed the children to observe the procedures, and the previous children to allay any anxiety that the subsequent children may have.

For one pair, the interview covered the topics of the child's past (where they were born and brought up, if not Addis Ababa when and why they moved there), their current family situation (who they lived with, if not with their parents why they had left their parents, whether their parents were alive and their marital status, information regarding any biological or step siblings), their religion, school life, morbidity, any involvement in street life and a few basic questions to assess the children's attitudes towards their lifestyle and future.

Meanwhile anthropometric data were collected from the other pair of children. Weight was measured using a Salter electronic scale (accuracy 0.2 kg) with the child wearing minimal clothing (i.e. a pair of trousers or skirt, and a T-shirt) and no shoes. Height was measured using a stadiometer positioned against a vertical wall; the child was asked to stand up straight with feet together and heels on the floor. Bianche supported the neck

applying slight upward pressure to extend the neck with the head positioned in the Frankfort plane (i.e. tilted forward so that the bottom of the eye is on the same horizontal plane as the top of the ear lobe). The head-board was lowered onto the child's head compressing the hair and a reading taken to the nearest 0.1 cm. The mid upper arm circumference was measured on the child's left arm. The mid upper arm was located measuring half way between the lateral tip of the acromion (located by palpating the shoulder area) and the elbow (when flexed at 90° with the palm facing upwards). Both points were marked using a water-soluble pen, with the arm then hanging freely at the child's side the midway point was found and marked. Using a special tape placed around the mid upper arm at the mark, and a reading taken to the nearest 0.1mm with the arm relaxed. Skin fold thickness was measured using a pair of spring loaded calipers. Initially I demonstrated on my own upper arm what was involved, explaining that the process does not hurt. Next I applied the calipers to the child's hand and asked them if it hurt. If they seemed wary or said that it did hurt I gave them the calipers to experiment with briefly, allowing them to practice on me or each other if necessary. Once the child was comfortable with the equipment I took measurements of their skin folds in four sites: the biceps, triceps, subscapular and suprailiac. At each of the four skinfold sites three readings were taken, releasing the skin fold between each measurement. The skinfold was picked up between the thumb and forefinger and the readings were taken two seconds after the full pressure of the calipers was applied. If one of the three measurements was more than 1mm different from the other two, it was discarded and where possible another reading was taken, otherwise an average of the two remaining readings was taken. The biceps measurement was taken from the front, and the triceps reading from the back, of the left arm where the mid upper arm was marked. I tried to ensure that the child relaxed his/her arm before taking these readings. The subscapular skinfold is located at the base of the left side suprailiac and the skinfold is taken near the left hip at a 45° angle from the vertical slightly above the illiac crest. The anthropometry measurements were conducted in accordance with Weiner and Lourie (1981). Certain possible sources of error exist with reference to anthropometry, particularly with respect of measurement error associated with skinfold measurement. Notably an underestimation of skinfold, particularly for those with larger skinfolds, is possible with repeated measurements due to the increased compression of the skinfold. This may, for example, have resulted in the difference in average skinfold between middle class and the other three groups to be underreported.

The anthropometric measurements were recorded Bianche on a data collection sheet (appendix A.1.5). She also completed a saliva data collection sheet (appendix A.1.6) for which she asked the children a few basic questions concerning the time they had arisen that morning, when and what they had last eaten and drunk, and what they had been doing so far in the day. The children were questioned in Amharic with their responses directly transcribed into English on the data collection sheet.

3.6.2. Limitations of phase one

The first phase of the research was not without problems and limitations, some due to practicalities and others due to my unwillingness to work solely according to the expectations of those around me. Fieldwork necessitates compromise: I was keenly aware that my research goals could not always be prioritised above all else. The conditions under which my research assistants and I worked were not ideal and therefore the results are perhaps not with minimum error. I suspect that errors are unlikely to be systematic and therefore should not bias comparisons to any large extent.

Throughout the study I believed that it was important, from an ethical standpoint, that the children were as fully aware as possible about the purpose of the study, thereby not creating false expectations and allowing informed consent. By my standards the research assistants' explanation to the children of the research was not ideal, and although they did appreciate my reasoning from a theoretical standpoint, they seemed unwilling to put it into practice. This was not helped by the lack of interest shown by the children towards the purposes of the study, except at the private school where the children were very inquisitive. Elsewhere it became clear that, from the children's point of view, if they had not wanted to take part they would not have come along in the first place. Most, in any case, knew what I was doing through word of mouth. My insistence on informed consent and anonymity was found by the children, organisation staff and my research assistants alike, to be a puzzling quirk. This may be in part because children in Ethiopia have traditionally be given few rights, they are culturally expected to obey adults. Such a viewpoint is slowly changing as child advocacy work is being undertaken by several NGOs in Addis Ababa and there is increasing official government concern over child welfare. Ultimately it was my own (ethnocentric) ethical

guidelines that determined the research practices more than culturally accepted behaviour; a dilemma faced by many researchers.

To facilitate results analysis it would have been advantageous to collect all the saliva samples in the morning so reducing the effects of circadian rhythm. In consultation with staff at each of the research sites, this was seen as unfeasible since it would necessitate that the children returned at a later occasion for anthropometric measures and the background data interview. It was envisaged that a large number of children would be unlikely to return as it my be inconvenient to them, they may have forgotten or lost enthusiasm for the research. As such additional difficulties have been present in interpreting the results, particularly in making comparisons with other studies.

On a more practical level, Ethiopian time and date systems are unusual to Westerners. The Ethiopia calendar is approximately 7 years and 113 days behind the Gregorian calendar; and the year consists of thirteen months. In Ethiopia time is told in two twelve hour periods beginning at sunrise and sunset (i.e. 6:00 am and 6:00 p.m. by Western time, therefore 2 o'clock by Western time is referred to as 8 o'clock in Ethiopia). I learnt quickly to remain mindful of potential confusions when I and others recorded time and date information and when arranging research appointments. Each evening I edited the data from that day's work, any time related queries were therefore immediately picked up and changed to Western time; other more general queries were also ironed out.

The children's ability to report their ages with accuracy varied between the sites. Most children at the private school could report their correct age and the month of their birthday. However at the other three sites this was rare; indeed at the NGOs some children struggled even to report their ages to the nearest year. This is a problem experienced by many researchers working with children from cultures where exact age is not regarded in the same way as it is in the West. Given that it was impossible to ask the parents of the children, a small proportion of the reported ages were estimates by the children, their friends, NGO staff and the research assistant. Such age reports were repeatedly corroborated throughout the fieldwork.

3.7. PHASE TWO

3.7.1. Methodology

Phase one produced cross sectional data from children in Addis Ababa, providing a measure of cortisol levels, investigating general anthropometric health and allowing the analysis of these measures in terms of the children's lifestyles. Phase two planned to go further using longitudinal methodology with a smaller sample of children. This data would be employed to corroborate cortisol results from phase one and to look specifically at cortisol variation at an individual level.

Sixty children took part in the second phase of the research, the aim was to recruit 8 girls and 8 boys at each site. The children were all recruited from those who took part in the first phase of the research, basic anthropometric and lifestyle interview data was therefore available and these children were a little more familiar with us and the research project. At all sites the children were chosen to reflect the full target age range of 8 to 14. At the street NGO the children were chosen at random by pulling names out of a hat from those who lived in the organisation's shelters, only 6 girls were available to take part in the study. At the community NGO and the government school the first children coming to us who filled each age and sex category requirement were recruited. At the private school the children were stratified according to age and chosen at random.

Over six consecutive days two saliva samples were collected each day, one early in the morning, at approximately 8.00 a.m., and one in the early afternoon, approximately 2.30-3.30 p.m. Daily activity was recorded through a verbal interview in Amharic, but the research assistant completed a data collection form directly into English (appendix A.1.7).

3.7.2. Limitations of phase two

I was aware that the sample size in phase two was relatively small thereby reducing the likelihood of statistically significant results, indeed more so when the children re-coded into lifestyle groups. There were sixty children in total who form a 20% sample of the

participants in phase one. Sixteen children at each site was also the maximum number of children that myself and one research assistant could feasibly work with at any one time. Financial and time constraints prevented recruiting a second research assistant or a longer period being devoted to the second phase.

Meeting with the researchers systematically affected the children's daily activity. This must be accepted as inevitable since the children could not have recorded their own daily activity, nor recalled it with sufficient detail at the end of six days. Self collection of the saliva samples would also have been inappropriate since time for Ethiopian children is a much more vague notion yet of critical importance for analysis due to circadian variation in cortisol levels. I was mindful to keep the disruption to a minimum and to fit into what was most appropriate in terms of data collection for each group of children.

Collecting complete data sets (12 samples) over the period for all the children proved problematic. Retaining the children's enthusiasm for the longitudinal study was difficult. Although the project was explained to the children at the start, some children lost interest after a few days. These children either fell out of the study or were uncooperative, making it hard for the research assistants to obtain all the information they needed. Contrary to the first phase it was the children at the more deprived sites who seemed most committed to the research. Considerable difficulties were experienced at the private school where the children were often more keen to spend their time playing than taking part in the research. Some children had problems remembering exactly what they had been doing and when on the previous day, this was a particular problem for the younger children. Nevertheless, over the six days those who were committed to the project became most adept at recalling the precise information needed.

Inconveniences were also associated with the time period over which the research was conducted. At the government school, the six days encompassed Ethiopian Christmas (7 January). I had decided to include this partly because time was running short and partly in the hope that some interesting data may emerge. However as school was closed that day the practicalities of meeting the children were complicated. At the private school, the time included Western Christmas which, as these children are exposed to above average Western influences, will have had some effect on their day.

During January, Ramadan was being observed by the Muslims, some of the children who were fasting during the day were uncomfortable rinsing their mouths out with water before giving saliva samples, where this was the case this aspect of the procedure was foregone.

3.8. FOCUS GROUP DISCUSSIONS

Throughout my time in Ethiopia, contextual detail were gathered through participant observation at each of the sites. Due to the comparative nature of the study, although I visited each site regularly throughout my fieldwork, I did not work at any one site for longer than two weeks at one time. With a longer fieldwork period, extended participant observation could have been a large and useful component of the research but with time limitations this was impossible. Near to the end of my time in Ethiopia I took the opportunity of conducting focus group discussions. I wanted to add context as perceived by the children to the data already gained, as well as information, from the children's points of view, about specific queries I had remaining. Means of personality assessment were explored, this is not reported here as the method used, of peer and adult supervisor ratings on a number of scales, was ultimately felt too general to be reliable or meaningful. I prepared two focus group discussion sessions each to fill a 45 minute cassette to be conducted twice at each site, once with the boys and once with the girls. It was necessary to divide the children at each site so that the groups were not too large and I felt it better to divide these sessions by gender having received advice that the children would feel less inhibited. Six children took part in each session; this appeared to be the maximum number possible to manage and keep the excitement level low. All but two of the children had taken part in both phases of the research, this allowed them to be more comfortable with each other and the researchers, as well as providing information more relevant to that data already collected.

The first focus group discussion centred on the problems and stresses that the children face in their daily lives and what worries them most. The areas of discussion included health, school life, home life, social situations, self image and threat to self. The second session was a more directed discussion on questions such as; what the children felt to be an appropriate name for themselves to be called as a group (i.e. street children, middle class, poor children); whether they felt there was an important difference between street

living and working children (asked to NGO children only); what personality traits they saw as beneficial to making someone successful within their lifestyle; what their main health problems were and how these affected them in terms of frequency, degree of seriousness, effect on earnings, treatment availability and preventability, who they felt controlled their lives; and how they dealt with the problems they faced (i.e. those discussed during in the first session).

I trained the research assistants, as facilitators, about the aim of these discussions, but as I was soon to be leaving Ethiopia I was only able to supervise a small number of the sessions with each researcher. We arranged for the tapes and their transcriptions into English to be sent to me via a fellow European researcher in Addis Ababa. Sadly this part of the research was not completed at the private school.

On reflection the focus group discussions should have been conducted first to allow the information gleaned from them to influence the methodology, and in particular the categorisation of children into lifestyle groups. However I was unsure that there would be sufficient time to complete both phases of the study, without further risking this by delaying the start of phase one due to the focus group discussions.

Chapter 4 - Description of sample and analyses

This chapter begins by examining the nature of the sample, explaining how the children were grouped into lifestyle categories and discussing representativeness. I go on to describe the sample in terms of the basic characteristics, including some social data, collected from the children. The chapter then describes the statistical analyses employed.

4.1. LIFESTYLE GROUP DESCRIPTION

As explained in the previous chapter, for analysis the children were categorised using interview data into four lifestyle groups, the definitions for which are given concisely in table 4.1. Analyses are not according to the geographical site at which the data was collected from the child. However, to indicate the overlap between geographical site and lifestyle groups, table 4.2 is a cross-tabulation showing the number of children from each geographical site in each lifestyle group.

Table 4.1. Definition of lifestyle groups and distribution of children between them

Lifestyle group	Definition	Male (%)	Female (%)	Total (%)
Street living children	children who work and sleep on the street	70 (86.4)	11 (13.6)	81 (100)
Street working children	children who work on the street and sleep at home	45 (50.0)	45 (50.0)	90 (100)
Poor non-street children	children with no working involvement with the street, who live in similar housing conditions to street working children	27 (37.1)	44 (62.9)	71 (100)
Middle class children	private school pupils	40 (50.0)	40 (50.0)	80 (100)
All children		182 (56.5)	140 (43.5)	322 (100)

Table 4.2. Re-coding the children from geographical sites into lifestyle groups

Site → / Lifestyle group ↓	Street NGO	Community NGO	Government school	Private school	Total
Street living children	**62**	19	0	0	81
Street working children	17	**44**	29	0	90
Poor non-street children	1	20	**50**	0	71
Middle class children	0	0	0	**80**	80
Total	80	83	79	80	**322**

4.2. REPRESENTATIVENESS OF SAMPLES

As my interest lay in contrasting lifestyle categories, a quota sample method was employed of urban Ethiopian children, covering four different data collection sites. Within each site random sampling of children was not feasible. Street children, by their very nature, do not form an easy population to sample accurately. The sampling methodology I employed at the street NGO and community NGO sites was what Ennew (writing for Save the Children, 1994) refers to as "opportunistic sampling" (i.e. the best that can be done in the circumstances). As such there are limitations concerning the representativeness of the children in each lifestyle category.

The three less privileged lifestyle groups were recruited from three geographical sites. Within each site, there was overlap of lifestyle characteristics of the children (shown previously in table 4.2). Thus the government school pupils were mainly poor non street children, with just over a third being street working children. The head of the government school regarded it to be representative of poor Ethiopian children. The community NGO children were half street working children, a quarter street living children and a quarter non street children. Finally the street NGO children were mainly street living children with a little over one fifth being street working children. The middle class children all came from one school; a private school but far from the most exclusive in the city, though these children were all well provided for. The staff believed it did not target any one section of the middle class community in Addis Ababa; for instance, there were not disproportional numbers of any religious or ethnic group in the school.

Most of the street working and all the street living children were recruited from NGO drop in centres and shelters. Some may argue that these are the unsuccessful street

children; those who, unable to survive the streets alone, turn to such NGOs for support. Alternatively these children may have grasped the ways of the street and are making the most of all resources available to them to make living or working on the street a success for them.

I have made two main checks that these sample populations of children are representative of their particular lifestyle. There are no significant differences in any anthropometic or cortisol measure between poor non street children recruited at the community NGO and those recruited at the government school. Also there are no differences between street living children recruited at the community versus street NGO, or those living in the NGO shelter against elsewhere. Nevertheless, considering the small numbers involved, these findings are difficult to interpret and are not subsequently pursued.

A second check made on the representativeness of the street working and living children comes from comparison of the structured interview data with data reported by Veale and Adefrisew for the Ministry of Labour and Social Affairs (MOLSA). MOLSA has published several reports on street children in Ethiopia. Despite criticism of data collection methods, the sampling techniques used are well designed. From the report by Veale and Adefrisew for MOLSA (1993) or 1,000 children and MOLSA's latest report (1995) of 10,000 street children, I can see considerable similarity with my data in terms of proportions with particular family backgrounds as reported by my sample of street living and working children (appendix section A2.2).

These checks indicate that the samples of children in this study are broadly representative of their urban lifestyle groupings, so suggesting that sampling was appropriate, given the difficult nature of the research practicalities and goals.

4.3. SAMPLE DESCRIPTION: BASIC CHARACTERISTICS

The aim was to include equal numbers of girls and boys. However, at the street NGO, there were a limited number of girls available to take part in the study, primarily because there are lower numbers of female street living children in Addis Ababa, the reasons for

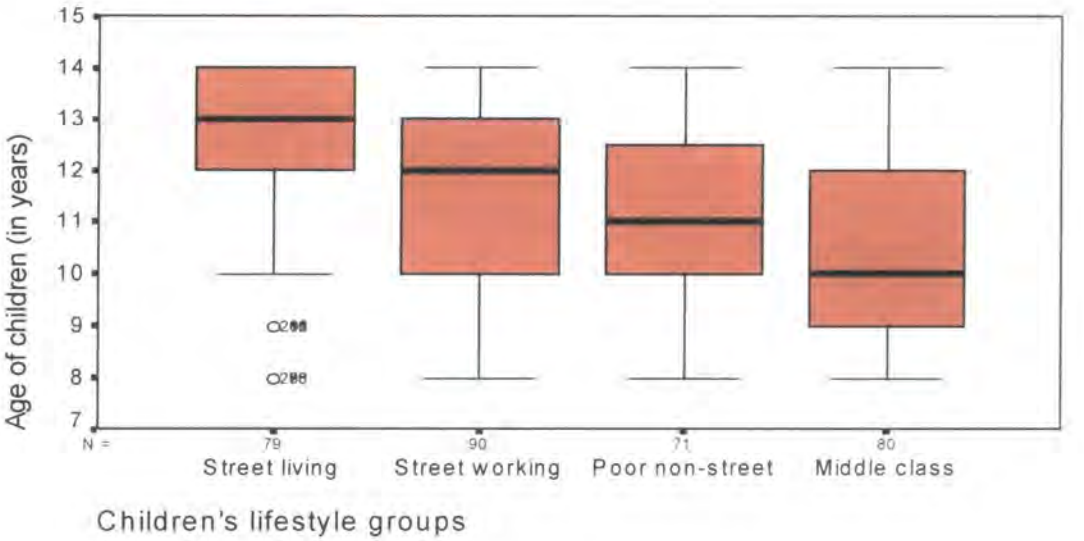
which are discussed in Chapter 3. The sex distribution between lifestyle groups is not even (refer back to table 4.1).

All children recruited were between 8 and 14 years old, the sample as a whole shows normal age distribution. Sample groups differ by age ($F=15.09$, $df=(3,316)$, $p=0.001$), with the street living children being the oldest and the middle class children the youngest, as shown in table 4.3 and graph 4.1. Girls and boys also differ in age, with males being significantly older ($t=2.90$, $df=286$, $p=0.004$). Age characteristic data by lifestyle group divided by sex are given fully in appendices tables A1-2. Age correction is made for all further analyses to avoid any bias in results between lifestyle groups due to this difference. Although attempts were made during fieldwork to avoid this difference, a full quota method for age was not considered appropriate, it may have encouraged children to lie about their ages so as to be part of the study. T-tests were used for post-hoc multiple comparisons following one-way analysis of variance and not the more appropriate Bonferroni, Scheffe or Tukey tests. Since this process produced the same results as other more statistically appropriate tests, I decided to use it as I had limited knowledge of statistical methods and found it had the benefit of being the most straight forward.

Table 4.3. Age characteristics of children

Lifestyle group	Mean age (years)	S. D.	No.	Street living children	Street working children	Poor non street children
Street living	12.27	1.68	79			
Street working	11.51	1.60	90	t=2.98, df=162, p=0.003		
Poor non-street	11.03	1.64	71	t=4.54, df=147, p=0.001	t=2.02, df=147, p=0.05	
Middle class	10.71	1.71	80	t=5.79, df=157, p=0.001	t=3.13, df=163, p=0.002	t=0.99, df=148, p=0.3
Total	11.39	1.75	322			

Graph 4.1. Age by lifestyle group



4.4. SAMPLE DESCRIPTION: LIFESTYLE AND BACKGROUND

One must be wary of ecological fallacy in interpreting patterns in results associated with ethnographic data. For example, if it were found that school children were taller and heavier for their ages, it does not necessarily mean that going to school makes children grow more; it is more likely that factors associated with enabling children to go to school are beneficial for their growth. Many inter-correlations are likely within these data. For example, children who work on the street may be less likely to go to school because street working interferes with their school attendance - alternatively it could be that working allows them to afford to attend school. Such associations are important, yet their interpretation is delicate; they help us understand the lives of the children whilst complicating analyses.

Much of the data collected through the structured interviews indicate specific aspects of lifestyle that impact upon the measures of health taken in this study. These data are analysed to ensure that differences found between lifestyle groups in anthropometric or cortisol outcome measures are not more satisfactorily explained by other specific variables thereby reducing the importance of general lifestyle on health outcomes. There is however a problem, in that the more statistical tests that are run on a set of data, the more likelihood there is of finding a significant result (by chance). Hence analyses must be guided by clear hypothesis testing.

This project aims to test whether there are significant differences in health and well-being between children living markedly different lifestyles, using measures of anthropometry and cortisol. Tests according to more specific background details of the children (reported in the following chapter) merely help confirm whether any anthropometric or hormonal differences between lifestyle groups are due to specific aspect of lifestyle or rather the lifestyle as a whole.

Here, data are presented to describe the sample, with further detail open to view in the appendices tables which are labeled with an "A" prefix. The data are reported by the child using a questionnaire methodology, as discussed in the previous chapter, their validity may therefore be questioned despite techniques being used aiming to minimise systematic errors. Two children were not interviewed; unless a specific "don't know" option is indicated in the data presented, the maximum number of children for whom data are missing for any one question is nine,. Missing data, being small in proportion, are not discussed further.

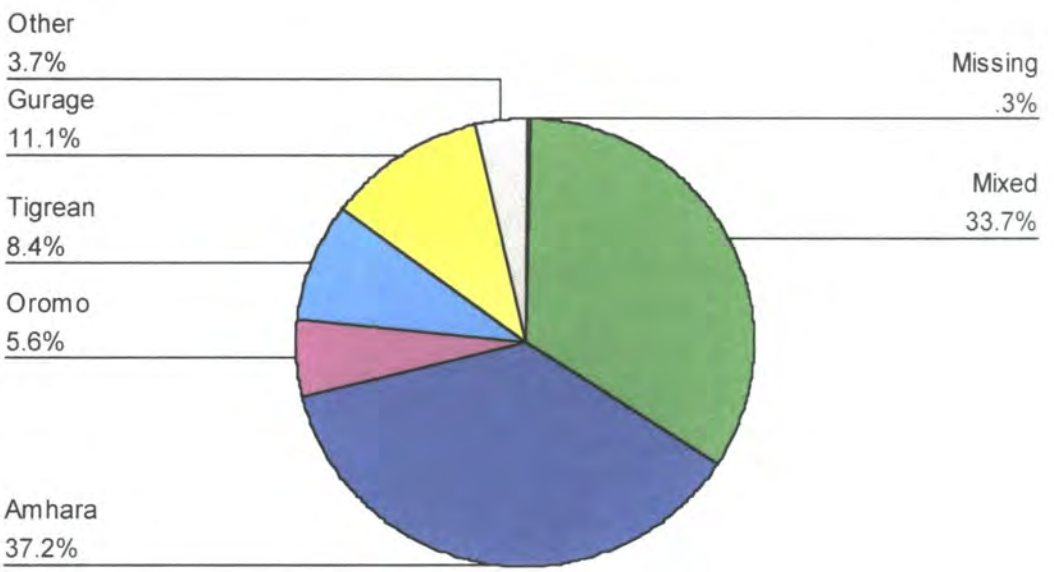
All comparative data cited from Nepal in this section are taken from the research by Panter-Brick and her colleagues, and in particular from a paper on demography of Nepalese street children (1997). It is worth noting that the Nepali study population was entirely male, one should remain mindful of the likely impact of this when comparing results.

4.4.1. Ethnicity and religion

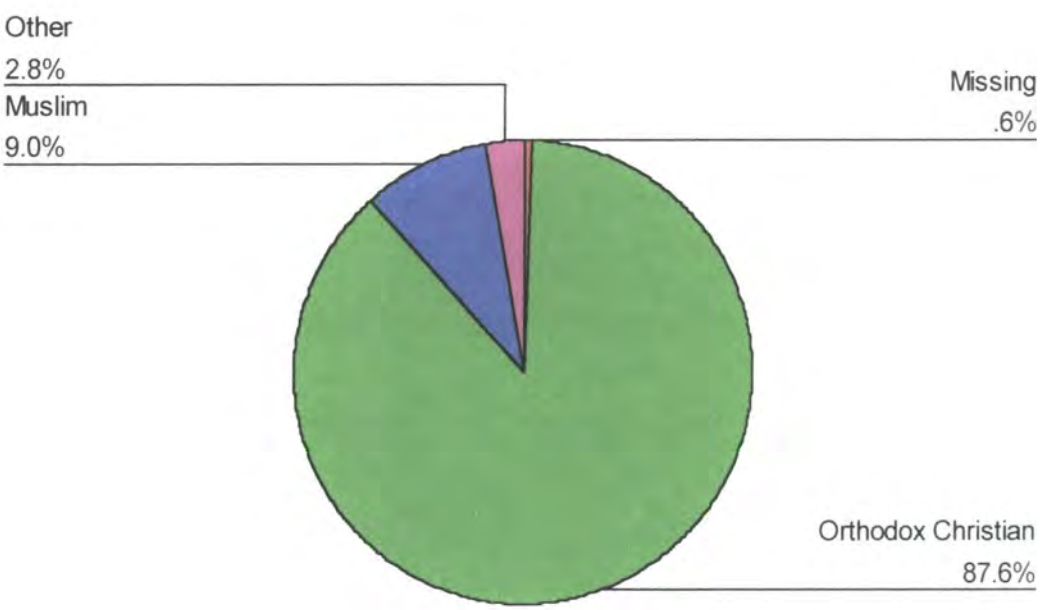
Ethnicity and religion are potential confounding factors in outcome variable relationships. There are four main ethnic groups relevant to this study, the Oromo, Amhara, Tigrayans and Gurage. Although there are approximately 80 tribes within Ethiopia, these represent the main groups within Addis Ababa. In today's urban Ethiopia, children with parents of different ethnic groups (mixed) are common. Graph 4.2 shows the distribution of ethnicity for the children (within the "other" group are Wellega and those from other African countries). Graph 4.3 shows the distribution of religion for the children ("other" religions comprise of Protestant, Catholic and Jehovah Witness). The religious distribution of the children is biased towards Orthodox

Christians, when compared to the national average of 54% Orthodox Christians and 33% Muslim (Parkes, 1995).

Graph 4.2. Distribution of children's ethnicity



Graph 4.3. Distribution of children's religion



4.4.2. Birthplace

Urban migration is often cited as one cause of 'streetism'. In this study street living children are more than twice as likely than children from the other groups to be migrants to Addis Ababa (table A3). The proportion of street children born in Addis Ababa from these data (an average of street living and street working children at 66%) is broadly similar to MOLSA's 1993 data (71%) (Veale and Adefrisew).

4.4.3. Family composition

The children were asked about their families, primarily to look into any differences in family composition between those less privileged children who no longer lived with their parents (street living) and those who do (street working and poor non street), and between poor children who do or do not work (street living/working and poor non street). The data are generally consistent with similar data from street children world-wide, as well as in Ethiopia from MOLSA's 1993 survey (Veale and Adefrisew).

As expected, with whom the child currently lives differs greatly between street working and poor non street children (table A4). Street working children are relatively less likely to live with both parents (31%) compared to poor non street children (57%), and more often live with their mother only (48% vs. 30%) or other kin (14% vs. 10%). This may be in part due poor non street children being considerably more likely than poor non-street children to have both parents still living (73% vs. 47%).

As compared to street working children, fewer street living children have their mother alive (66% vs. 88%) and, it follows, fewer have both parents alive (40% vs. 47%). A similar proportion of street children (an average of street living and street working children) were found to have lost one parent in this study (40%) as in MOLSA's 1993 data (32%) (Veale and Adefrisew) and MOLSA's 1995 study (40%). Equally, the proportion of street children who are orphaned is similar between this study (7%) and MOLSA's 1993 (Veale and Adefrisew) and 1995 data (8% and 6% respectively). Overall, the families that street living children had left were less likely to be intact, and more likely to involve step parents than any other group. For more detail on parental variables see appendices tables A5-9.

The children were asked about both their biological and step/half siblings (tables A10-12). The number of siblings ranged from none to eight. Street living children had significantly less siblings than the three other groups combined ($t=7.40$, $df=237$, $p=0.001$). In this Ethiopian sample, street living children were more often the youngest children, with street working and poor non-street children more often middle children.

Street working children significantly more often reported having a sibling who worked on the streets (47%) than either street living (33%) or poor non street children (26%). However a large proportion of the street living children were unable to report whether their siblings worked on the street or not (23%) which may distort the true profile.

4.4.4. Daily activity

An individual's daily activity impacts upon their general well-being. For children in Ethiopia this includes school and/or work. The reported data from my sample show that, despite heavy involvement in work activities, most street living and street working children attend school (57% and 92% respectively, table A13). However it is important to note that the proportion, particularly of street living children, attending school is over-exaggerated in this sample since many are funded by the NGOs where data collection took place. These data are therefore radically different to that from MOLSA's researchers 1993 and 1995 who, being Ethiopian and working on a much larger project, could collect data from children found on the street rather than through NGOs working with such children. Of the 41 children in my sample who did not currently attend school, 32% had never been to school and 68% had dropped out.

The most frequently reported main jobs of those who worked on the streets were carrying loads and begging for street living children, and street vending and shoe shining for street working children (table 4.4 below). Differences between my data and that from MOLSA may be due to my sample being taken from Addis Ababa alone. Begging, although not the most common main source of income, was twice as prevalent in Ethiopia (42%) than for the Nepali boys (21%); rag picking was very common in Nepal (67%) but to my knowledge rare as a source of income amongst Ethiopian street children. Thirty six per cent of the children had secondary jobs.

The children were asked who they were most often with whilst working on the streets and how long on average they spent working on the streets each day. Sixty nine per cent of all children who worked, did so with friends, 17% worked alone and 12% worked with kin (normally mother or siblings). The average reported time spent working each day by the street living children is 8:00 hours (±2:50) and for street working children is 5:10 hours (±2:20). Forty-one per cent of the street living and 7% of street working children report spending more than 8 hours working each day. This figure is likely to include some of the time the children spend on the streets chatting and playing, whilst waiting and looking for opportunities to work. MOSLA 1995 report 33% of street children to work less than half a day, 17% half a day, 5% more than half a day and 30% to work a full day. Thirty eight per cent of the children in my sample who work on the street claim never to have been hurt, 40% say they are regularly hurt now and 22% have been hurt in the past but not currently. Being regularly (once per week or more) hurt on the street is more common amongst street living children (57%) than street working children (21%).

Table 4.4. Main street work

Lifestyle group	begging %	carrying loads %	street vending %	shoe shining %	Other* %	% (number)
Street living children	42.0	45.7	2.5	4.9	4.9	100 (81)
Street working children	18.9	5.6	47.8	20.0	7.7	100 (90)
Both groups	29.8	24.6	26.3	12.9	6.4	100 (171)

* "Other" includes taxi callers, taxi money changers and car minders.

MOLSA 1993 (4 towns)	12.0	19.0	35.2	19.4	13.6	100 (969)

The average earnings of the street living children is 2.04 (±1.16) birr (then approximately 20p, enough to buy a reasonable mid day meal) and for the street working children it is 2.28 (±1.17) birr. Seventy-seven per cent of street living and 66% of street working children report earning 2 birr or below each day. Eighty-two per cent of street living and 44% of street working children reported regularly receiving gifts in kind, mainly food, with some getting clothes. Eighty two per cent of the street working children gave their earnings to their parents or guardians, the rest spent it on food,

clothes and other things for themselves. For the street living children, most (90%) reported spending their earnings on necessities.

Any effect of street living or working is expected to be greatly affected by the length of time the child has been part of a street lifestyle (table A14) and the age of joining the street. Of the 81 street living children, 3% reported joining the street aged 5 or below, 54% aged 6 to 10, and 22% aged 11 or above, 21% did not know when they had left home. Of the reasons stated for having left, 51% stated arguments within the household (27% involved step parents, 20% involved violence, 2% were over economics and 2% due to the child being naughty). Twenty-three per cent reported economic reasons, 13% said because of parental death or family disruption, 6% had no reason, and 6% report having been abandoned. Similarly, family problems were the most reported reasons for leaving home for children in Nepal (42%), compared to economic reasons (35%) and a desire for independence (23%) (Panter-Brick *et al.*, 1996).

4.4.5. Problems and illness

The children were all asked to report any problems they were experiencing in their lives at the current time. As expected street living children least frequently reported having no problems in life in general, followed by street working children. Almost half of the poor non street and, again expectedly, all the middle class children reported no problems. Interestingly food was the main reported problem for considerably more street working children than street living children (table A15).

Illness on the day of questioning was reported most often by street working children and poor non-street children, followed by middle class children (table A16). This of course reflects children's willingness to report illness and/or their understanding of illness, as well as the consequence of interrupting normal daily activity. The most common current illnesses reported were respiratory (7%), stomach problems (7%) and headache (6%). Four per cent of the children's reported current illnesses were chronic illness such as asthma, epilepsy and TB. Other illnesses included toothache, earache, eye pain and skin rashes and grazes (13%).

4.4.6. Child's perceived support in and control of life

The children were asked to rate the support they felt they received from their family and peers (1 representing no support and 5 representing excellent support; tables A17-18). The results are as expected for family support, with street living children most commonly reporting least support (80% scored 1), street working children still somewhat poor support (48% scored 2), with poor non street children more frequently reporting excellent support (34% scored 5) and middle class children almost exclusively reporting excellent support (96% scored 5). In terms of peer support street living children predominantly feel they have excellent support (65% scored 5), however all three other groups predominantly report poor peer support. Children were also asked who or what they felt controlled their lives (table A19). Street living children most frequently reported themselves as controlling their lives, while the other three groups reported relying on their families.

4.4.7. Current feelings

In the cross sectional phase the children were asked to rate how happy they were with their lives and how good the current day was. Again using the circles representing a scale of one to five, the results are shown in the two tables below. During the longitudinal phase each day the children were asked to rate how good the current day was and how worried they were feeling that day. The results are generally as expected, care must be taken of placing excessive emphasis on these results as they may be subject to reporting bias with regard to the impression the children wanted the researchers to obtain.

Table 4.5. Child's rating of how good current day is for cross sectional phase

Lifestyle group	Number of children (%)					Number
	1	2	3	4	5*	
Street living	8 (10)	10 (12)	21 (26)	17 (21)	24 (30)	80
Street working	8 (9)	8 (9)	24 (27)	27 (30)	23 (26)	90
Poor non street	3 (4)	2 (3)	18 (25)	21 (30)	27 (38)	71
Middle class	5 (6)	3 (4)	13 (16)	22 (28)	37 (46)	80
All children	24 (7)	23 (7)	76 (24)	87 (27)	111 (35)	323

* 1 is very bad day and 5 is very good day

Table 4.6. Child's rating of how happy they are with their lives for cross sectional phase

Lifestyle group	Number of children (%)					Number
	1	2	3	4	5*	
Street living	33 (41)	16 (20)	16 (20)	7 (6)	10 (13)	80
Street working	21 (23)	27 (30)	26 (29)	8 (9)	8 (9)	90
Poor non street	2 (3)	13 (18)	21 (30)	16 (23)	19 (27)	71
Middle class	0	2 (3)	3 (4)	11 (14)	64 (80)	80
All children	56 (17)	58 (18)	66 (21)	40 (13)	101 (32)	323

* 1 is very unhappy and 5 is very happy

4.5. SUMMARY OF MEASURES

To provide an overview of the study, the variables measured in this study are summarised in table 4.5 below.

Table 4.7. A summary of the variables

Basic (independent) variables	**Lifestyle (semi-independent) variables**	**Outcome (dependent) variables**
Background Age Sex Ethnic group Religion	**Lifestyle mediators** Family composition (number of siblings, birth order, parents' marital status, parents alive/dead/absent, step parents, etc) Parents' status (career and education) Shelter type and with whom the children live School attendance Street life Children's evaluation of day and lifestyle Morbidity	**Physical/anthropometric** Height and weight Growth status (z-scores for height-for-age, weight-for-age and weight-for-height) Body fat (sum of skinfolds) Muscle and fat measure (mid upper arm circumference)
Data collection groups Geographical site (not analysed)		
Study target groups Lifestyle groups		**Physiological** Cortisol level (corrected for circadian rhythm and post-prandial variables) Cardiovascular measurements (diastolic & systolic blood pressure and resting heart rate) - not analysed here

The following abbreviations are used throughout: height-for-age z-score - HAz, weight-for-age z-score - WAz and weight-for-height z-score - WHz, mid upper arm circumference - MUAC and sum of skinfolds - SSF.

4.6. ANTHROPOMETRIC ANALYSES

The analyses conducted on the results is explained fully below. Particular attention is paid later to cortisol, as confounding variables create particular difficulties associated with these analyses.

4.6.1. Anthropometric statistical procedures

All statistical analyses for the cross sectional phase were completed using SPSS for Windows (Version 6.1.3, 5 December 1995). ANOVA were used to determine the statistical significance of differences between groups for continuous variables. T-tests were used to compare any two groups for continuous variables, so identifying exactly where group differences identified by ANOVA lie. The results obtained for t-tests assume unequal sample variance. Multiple regression analyses were used to determine relationships between variables and the influence of confounding variables, most notably age and/or sex. The residuals (unstandardised) from the regressions were saved which act as "abstract" figures for the outcome variable adjusted for the confounding variables. ANOVA and t-tests were then run on the residuals to test for group differences unaffected by confounding variables. Most statistical test results are given to an accuracy of two decimal points. Statistical significance is taken at 95% confidence ($p=0.05$). Where significant results are presented in tables, the box is shaded.

For sum of skin folds (SSF) the three measurements taken for each of the four skin fold body sites were averaged. The four values for biceps, triceps, subscapular and scapular were then summed to produce an overall estimate of total body fat.

Weight data were corrected for minimal clothing worn by the children (up to two items of thin cotton clothing): 0.4 kg was subtracted from each child's weight to compensate for this. The type of "minimal clothing" was not different between the three less privileged sites; jeans were somewhat more common among the private school pupils. As denim is heavy this will have over-estimated the weights of some middle class children. Raw height and weight data are not analysed due to age and sex confounding effects, instead z-scores are presented to examine the children's growth status.

Height, weight, age and sex data were used to calculate standardised anthropometric measures to allow comparison of growth status between lifestyle groups. A specifically designed computer package called ANTHRO (Version 1.01) was used, developed in 1990 by Sullivan (U.S. Department of Health and Human Services) and Gorstein (Nutrition Unit, WHO). Z-scores, the number of standard deviations away from the

median of a U.S. reference population (NCHS), were calculated for height-for-age (HAz), weight-for-age (WAz) and weight-for-height (WHz). Due to the disruption to growth that the onset of puberty brings, for boys over 11 years and 6 months or taller than 1.45m and girls above 10 years or with height over 1.37m, WHz cannot be calculated according to a simple relationship to the NCHS reference curve. For these children a conditional index of weight adjusted for height, developed by Cole (1993) was used, producing reliable z-score figures (after Panter-Brick *et al.*, 1996). The index was developed from the correlation (r) between log weight-for-age and log height-for-age measurements for U.S. children; r is a constant dependent upon the child's age and sex, and used in the following equation: $WHCz=(WAz-rHAz)/\sqrt{(1-r^2)}$ (see Cole, 1993).

4.6.2. Anthropometric outliers

Outliers were excluded if they fell outside the 5th and 95th percentiles; these were 2 extremely stunted children (low HAz) and 10 considerably overweight children (as shown by high values of anthropometric measures). The two outliers excluded for HAz, a 13 year old middle class (case 084) and a poor non-street boy aged 11 (case 191) (HAz= -5.01 and -3.89 respectively). The former value suggests a data error firstly because the child was from the middle class group and secondly as survival at this level of stunting would be extremely rare. The latter value, providing the age was reported and recorded accurately, would represent a child with a very serious case of stunting. The lowest HAz kept in the data set was -3.67. The line drawn to exclude outliers is to some extent arbitrary, but does ensure that any group differences are not caused by children unrepresentative of the lifestyle group as a whole.

The ten overweight outliers are WAz of 1.78, WHz of 2.10, 2.09 and 1.91 and six SSF measures of between 67.33 and 92.17mm. These measures are primarily from middle class children who act as a well nourished local control group. In removing these high outliers, the z-score and fat level of the middle class children may be underestimated. I removed these cases so as not to over-exaggerate the optimal Ethiopian growth status comparison group. Most of these children were visibly overweight. Additionally, the skinfold measures were also excluded because once skinfolds become too large, there is increased error in the measuring technique used, particularly for girls it becomes hard to separate the fat from muscle for a successful skinfold measurement.

4.6.3. Reliability of measures

The technical error of measurement (TEM) and coefficient of reliability R were calculated for repeat anthropometric measures on six children (after Ulijaszek and Strickland, 1993:123-125). This gives an indication of the intra-observer error of the measurements, all taken by myself. TEM is calculated using the following equation: $\sqrt{(\sum d^2/2N)}$, here N=6. TEM for height was 0.27 cm, for mid upper arm circumference 0.25 cm, for biceps 0.31 mm, triceps 0.09 mm, subscapular 0.15 mm and scapular was 0.51 mm. R was found to be greater than 0.99 for all measures, indicating good reliability.

4.6.4. Confounding variables for anthropometric measures

Differences between lifestyle groups in age and sex distribution were shown in section 4.2.1 and therefore need to be controlled for when analysing variables that correlate with age and/or sex. This was done by regressing age and/or sex against the target variable and saving the unstandardised residuals to be used as corrected (but abstract) values for comparison between groups. Table 4.6 indicates which dependent variables correlate with sex and/or age (results of correlations with age and t-test for sex differences). Since some of the conclusions reached in this thesis involve only the three less privileged groups, these are also examined separately for correlations. On all measures where differences between the sexes were found, girls had higher mean scores indicating better growth status and higher fat stores than boys. Correcting for age is particularly important for the z-scores because they are based on an international rather than local reference curve which may cause biases. The table below shows that the majority of anthropometric measures are affected by age and sex, I have therefore decided to correct for both these factors using multiple regression for all anthropometric analyses.

Table 4.8. Significance of age and sex on outcome variables

Groups analysed ↓	Physical variables →	HAz	WAz	WHz	SSF	MUAC
All four groups	Age (correlation)	r=-0.18 p=0.001	r=-0.16 p=0.001	r=-0.01 p=0.9	r=0.17 p=0.003	0.48 p=0.001
	Sex (t-test)	t=1.65 df=302 p=0.1	t=3.32 df=314 p=0.001	t=1.89 df=274 p=0.06	t=5.87 df=233 p=0.001	t=2.76 df=243 p=0.006
Three disadvantaged groups, without the middle class	Age (correlation)	r=-0.11 p=0.08	r=-0.16 p=0.01	r=-0.10 p=0.1	r=0.23 p=0.001	r=0.56 p=0.001
	Sex (t-test)	t=1.60 df=214 p=0.1	t=4.5 df=223 p=0.001	t=2.28 df=195 p=0.02	t=7.10 df=129 p=0.001	t=2.96 df=165 p=0.3
Conclusion	Control for	Age	Age and sex	Sex	Age and sex	Age and sex

Subsequent reference to "any anthropometric variable" refers to testing height-for age, weight-for-age and weight-for-height z-scores, sum of skinfolds and mid upper arm circumference, all corrected for age and sex.

4.7. CORTISOL ANALYSIS

4.7.1. Cortisol radioimmunoassay analysis

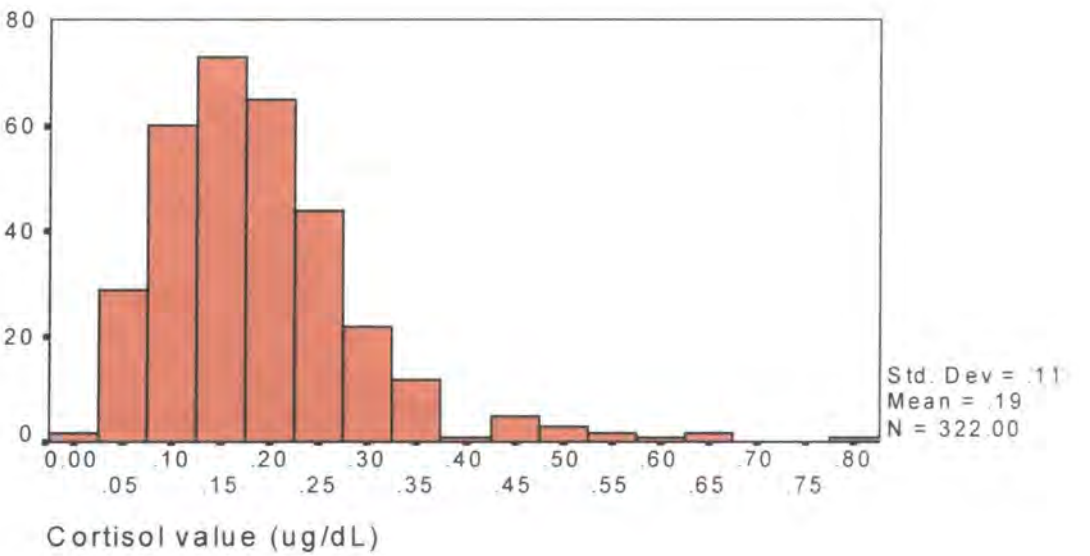
I analysed the salivary cortisol at the Dunn Medical Research Council Nutrition Laboratories in Cambridge, where Dr Peter Lunn kindly oversaw and supported my laboratory work. Clinical assays™ were conducted using GammaCoat™ (^{125}I) cortisol radioimmunoassay kits. This is designed to determine quantitative cortisol (hydrocortisone, Compound F) levels using a procedure based on the competitive binding principles of radioimmunoassay. Standard solutions are mixed with the saliva samples in antibody-coated tubes; these are incubated allowing the cortisol to be immobilized onto the inner wall of the tube. The tubes are then emptied, left to drain and the tube's radioactivity counted using a gammacounter. The gammacounter is programmed to produce a standard curve from the pure standards included in each batch. Against this curve, from the radioactivity of each tube, the amount of cortisol in each saliva sample is calculated (Incstar Corporation instruction manual, undated). The total laboratory cost of the cortisol analysis (approx. 1,000 samples) was £970 (plus disposables).

4.7.2. Cortisol statistical procedures - Cross sectional data

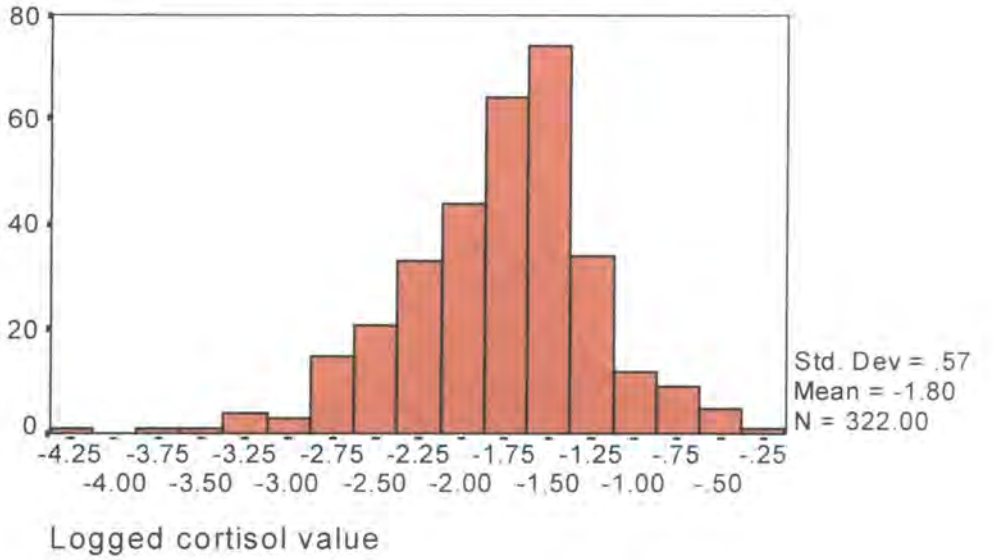
4.7.2a. Circadian Rhythm Effects

Due to circadian rhythm, cortisol values are highly skewed. Most researchers therefore work with logged cortisol values to normalise distribution and facilitate statistical analysis. The raw data of this study, sampled from 8:10 a.m. to 4:55 p.m., are skewed (graph 4.4) and are logged to approximate a normal distribution (graph 4.5). There is one extreme outlier (seen in graph 4.4) from a 13 year old, street living boy (case 168). The boy is not unusual in any other way; he is only mildly stunted and underweight. This value, at 0.815 µg/dL, is well within the range found in longitudinal sampling of this study (0 to 1.293 µg/dL) and is a morning value (time of sample - 10:40) so expected to be higher. This value is therefore retained for analysis.

Graph 4.4. Distribution of absolute cortisol values over whole day



Graph 4.5. Distribution of logged cortisol values over whole day



Due to the nature of the fieldwork it proved impossible to sample children with tight control for variables known to affect cortisol levels, most notably circadian rhythm. Such variables must therefore be controlled for in statistical analysis. Cortisol values should be corrected for "time since normal waking time", as waking time is when cortisol levels peak (Flinn, 1998). In practice circadian rhythm is problematic in analysis, and it is important to note that this is not dealt with consistently between studies. For instance Gunnar, Tout, de Haan, Pierce and Stansbury (1997) measured all children in their study at the same absolute time (between 10.00 and 10.30 a.m.), whilst Fernald and McGregor (1998) balanced the time of sample collection between their study groups so circadian rhythm would not affect the hypothesis being tested. Such methodologies assume equal or random normal wake up time across all participants, so avoiding the need to statistically control for circadian rhythm. For their part, Flinn and England (1995, 1997) as a result of a vast number of samples, are able to standardize all samples by 5 minute intervals from wake up time. This is the ideal since "even small differences among individuals in their sleep schedules (e.g. 6:30 am versus 7:00 am wake-up) result in large differences in morning cortisol levels" (Flinn, 1999:117).

In certain contexts, gaining detailed and accurate information about children's normal waking times may be feasible. This is not so for a cross-sectional study over a relatively short period of time with children who have less rigid routines than Western children, and in a culture where time accuracy is not considered very important. One must accept that waking times for the children may not be stable day-to-day, nor is data accuracy

guaranteed (they are both reported and recalled so vulnerable to double error sources). The data available here are reported waking time for the child on the day of the saliva sample only: waking time ranged from 5:00 a.m. to 10:00 a.m., averaging 6:50 a.m. Since there are significant differences in waking times between the lifestyle groups ($F=4.83$, $df=(3,318)$, $p=0.003$), wake up time must be corrected for when testing group differences. Notably, significant differences lie only between the middle class children and each of the other groups, with the middle class children waking earlier (table 4.7). There are no significant differences between the three less privileged groups.

Table 4.9. Children's waking time on day of saliva sample (reported)

Lifestyle group	Reported mean wake up time (hr:min)	S. D. (hr:min)	No.	Street living children	Street working children	Poor non-street children
Street living	7:03	1:00	81			
Street working	6:54	0:52	90	t=1.12, df=159, p=0.3		
Poor non-street	6:49	0:56	71	t=1.55, df=149, p=0.1	t=0.58, df=145, p=0.6	
Middle class	6:33	0:33	80	t=3.95, df=124, p=0.001	t=3.09, df=152, p=0.002	t=2.02, df=109, p=0.05
All children	6:50	0:52	322			

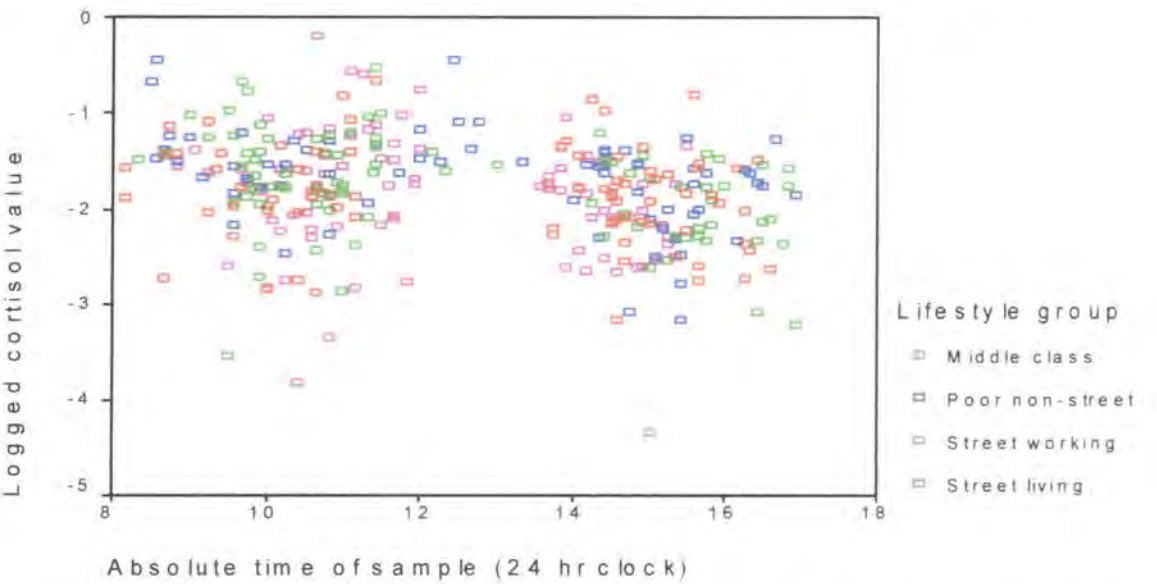
In this study, absolute time of sample was recorded accurately by myself, to the nearest 5 minute interval. Time since waking is calculated from child's reported waking time and the researcher recorded time of sample (table 4.8), with data given for boys and girls separately in tables A21-22. There is no significant difference between the lifestyle groups for absolute time of sample ($F=1.19$, $df=(3,318)$, $p=0.3$) nor for time of sample since waking ($F=1.15$, $df=(3,318)$, $p=0.3$).

Table 4.10. Time of sample (observed) and time of sample since waking (calculated)

Lifestyle group	Sample time (hr:min)		Sample time since waking (hr:min)		No.
	Mean	S. D.	Mean	S. D.	
Street living	12:52	2:37	5:49	3:00	81
Street working	12:26	2:38	5:33	2:49	90
Poor non-street	12:47	2:39	5:59	2:38	71
Middle class	12:25	1:58	5:40	2:02	80
All children	12:34	2:37	5:44	2:39	322

There is a negative correlation between logged cortisol and absolute time of sample (r=-0.26, p=0.001), as seen in graph 4.6; this correlation is slightly weaker between logged cortisol and time of sample since waking (r=-0.24, p=0.001). Although there are no group differences between the lifestyle groups for time of sample or time of sample since waking, I decided to control for circadian rhythm to increase accuracy and allow analysis to go beyond these categories.

Graph 4.6. Logged cortisol against time of sample showing a significant negative correlation



Post-prandial effects are also seen in cortisol variation. To fully control for these effects, exact information is needed on when the child last ate or drank. In this study children reported whether and when food or drink had been consumed on the day of the study. I calculated time elapsed between saliva sample for both food and drink consumption. Where food or drink had not been consumed so far that day, a score of zero was entered for all post-prandial variables.

4.7.2b. Controlling for confounding variables

Each of the four variables mentioned above was regressed independently against logged cortisol (table 4.9).

Table 4.11. Separate regressions of variable against logged cortisol

Variable	Coefficient of regression (r)	Significance (p)	Percentage of variation explained (r^2)
Absolute time of sample	-0.260	0.0001	6.8
Time of sample since waking	-0.242	0.0001	5.9
Time since last eating	0.056	0.3	0.3
Time since last drank	0.017	0.8	0.03

As regression is not significant for the post-prandial variables, these have not been included in any further analysis. The focus therefore rests with circadian rhythm effects. A multiple regression of both absolute time of sample and time of sample since waking against logged cortisol shows no greater explanatory power than absolute time of sample regressed alone (both r=6.8%). Therefore despite the fact that time since waking would be more appropriate variable to control for theoretically, I control here for absolute time of sample alone. These latter data can be guaranteed as accurate and the correlation proves to be the stronger of the two (table above). Hence, the residuals from the regression analysis of absolute time of sample against logged cortisol (referred to as "logged cortisol residuals") are used in subsequent cross sectional cortisol analysis such figures are logged cortisol figures corrected for circadian rhythm effects. By contrast, absolute cortisol values are not corrected for such confounding variables. Although no analyses are conducted on these figures, it is important to present and discuss them briefly to be able to compare absolute values with other studies of cortisol.

Four other variables known to affect cortisol levels are not included in the present analyses. Smoking has been found to have short term elevatory effects on cortisol levels (Kirschbaum, Wüst and Strasburger, 1992, cited Kirschbaum and Hellhammer, 1994) and long term blunting effects for habitual smokers (Kirschbaum, Strasburger and Langkrär, 1993, cited in Kirschbaum and Hellhammer, 1994). Some of the street children did smoke, however this was mainly at night time rather than at times which would affect cortisol samples. For this reason and because I felt it was insensitive to ask all the children about smoking habits, data on this variable are not available. Physical activity, morbidity, psychological stress and caffeine also affect cortisol level. Despite some data being available for the former three variables, these were not controlled for due to difficulties in quantifying such variables.

Differences in cortisol for four main individual characteristics (age, sex, ethnicity and religion) were however investigated. The logged cortisol residuals (i.e. corrected for circadian rhythm) do not correlate with children's age ($r=0.04$, $p=0.5$), nor do they differ by sex ($t=1.65$, $df=295$, $p=0.1$). As expected, there are no differences due to children's ethnicity ($F=1.63$, $df=(5,316)$, $p=0.2$) or religion ($F=0.50$, $df=(2,318)$, $p=0.6$). These factors do not therefore need to be controlled for in any analyses of group differences in corrected cortisol values.

4.7.3. Cortisol statistical procedures - Longitudinal data

4.7.3a. Confounding variables

The data for the longitudinal phase come from a total of 646 samples from 58 children (table 4.10). As described in detail in the fieldwork chapter, samples were collected in the morning and afternoon for 6 consecutive days, but some children were unable to meet me every morning and afternoon. Table 4.10 also shows the average number of samples from the children in each lifestyle group. Such data for boys and girls alone are provided in the appendices (tables A22-23).

Table 4.12. Samples for longitudinal cortisol data for all children

Lifestyle group	Morning		Afternoon		Total		Number of children
	Number of samples	Mean number of samples per child	Number of samples	Mean number of samples per child	Number of samples	Mean number of samples per child	
Street living	112	5.9	112	5.9	224	11.8	19
Street working	81	5.8	77	5.5	158	11.3	14
Poor non street	53	5.9	44	4.9	97	10.8	9
Middle class	86	5.4	51	5.1	167	10.4	16
All children	332	5.7	314	5.4	646	11.1	58

Longitudinal cortisol data were analysed in part using SPSS, but also in more detail using MLN, a software program for N-level analysis (Woodhouse, 1995), because SPSS cannot take into account multiple samples from a several subjects. The 58 children gave up to 12 samples each, therefore the cortisol values from each individual are not independent from each other. SPSS can only treat them as independent variables, for example in a regression analysis; MLN has been used to overcome this limitation for some analyses.

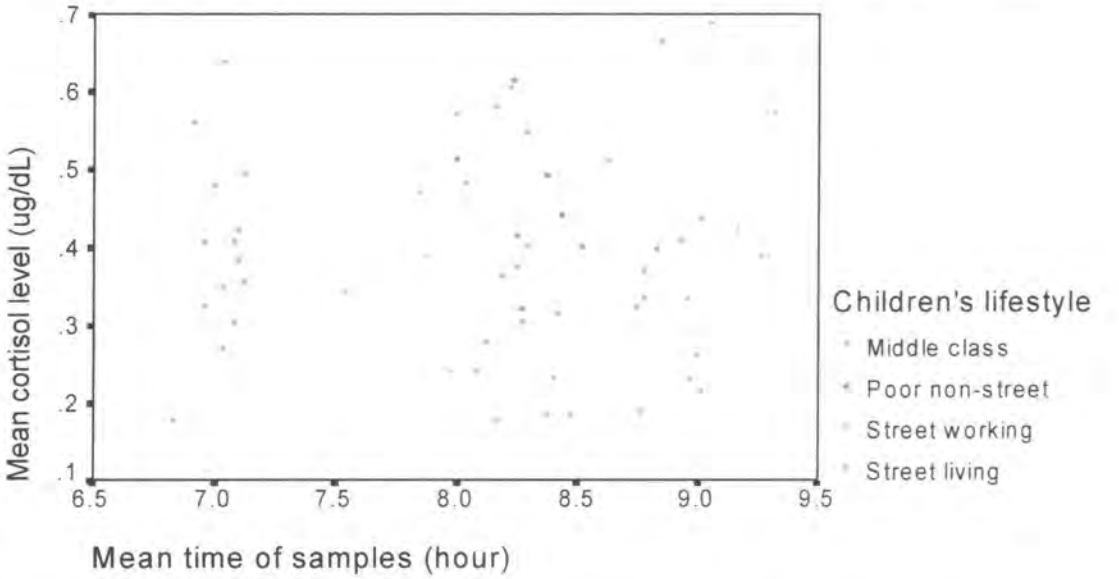
Two saliva samples were collected from each child every day; the morning sample at approximately 7:00-8:00 a.m. and the afternoon sample at approximately 2:30-3:30 p.m. Due to the highly flexible and mobile daily lifestyle of street children, I was unable to collect saliva samples at the same time each day from each of the street children. The school children formed more "captive" subjects; nonetheless the time of sample collection needed to accommodate their daily routines. The mean absolute time of sample and time of sample since waking is shown in table 4.11 below; these data are given for boys and girls separately in the appendices (tables A24-25). There is a significant difference between the mean time of sample for each lifestyle group within the morning samples ($F=14.81$, $df=(3,54)$, $p=0.001$) and within the afternoon samples ($F=5.60$, $df=(3,54)$, $p=0.002$). This difference is shown below in graphs 4.6 and 4.7, coded for lifestyle groups. There is also a difference between lifestyle groups for time of sample since waking in the morning ($F=15.12$, $df=(3, 54)$, $p=0.0001$) although not in the afternoon ($F=2.55$, $df=(3,54)$, $p=0.07$). Analyses must therefore be conducted with the (logged) cortisol values controlled for circadian rhythm.

Table 4.13. Sample time data for all children (mean of means for each child)

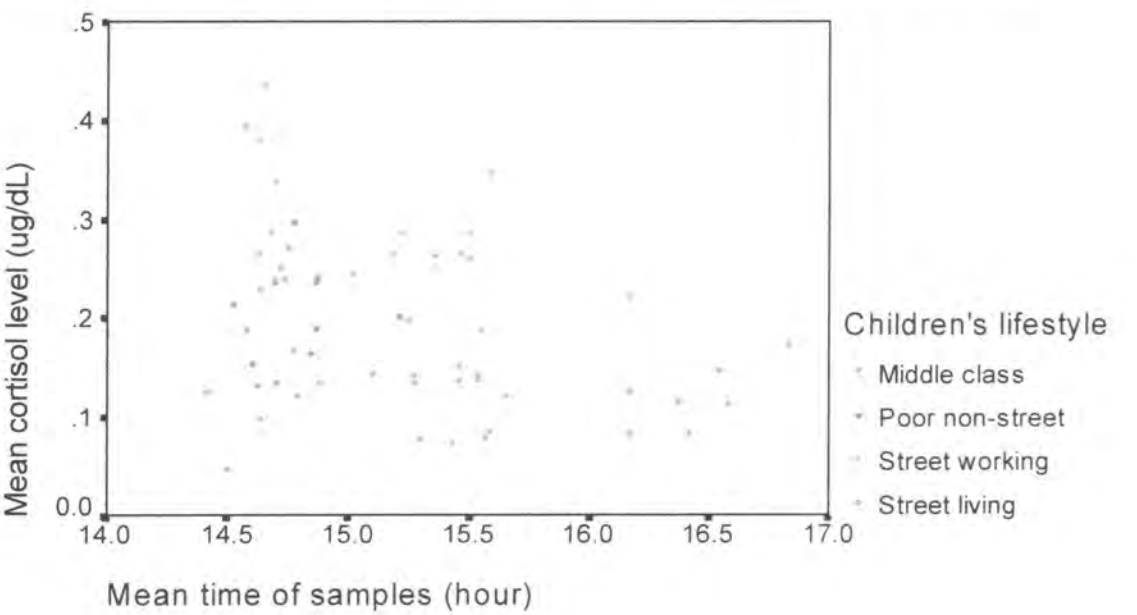
Lifestyle group	Absolute time of sample				Time of sample since waking				Number of children
	Morning		Afternoon		Morning		Afternoon		
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	
Street living	7:31	0:51	15:21	0:53	0:52	0:11	8:42	1:33	19
Street working	8:46	0:25	14:53	0:16	1:48	0:31	7:55	0:37	14
Poor non street	8:25	0:17	14:49	0:13	1:38	0:11	8:03	0:21	9
Middle class	8:08	0:15	15:32	0:12	1:18	0:36	8:42	0:35	16
All males	8:08	0:44	15:13	0:37	1:20	0:34	8:25	1:02	58

As with the cross sectional data, regression analysis was used to correct for circadian rhythm effects. Using MLN, logged cortisol values were regressed against absolute time of sample to correct for circadian rhythm. Data were analysed using a random coefficient regression model; this is a regression which takes into account that more than one cortisol sample was taken from each child. There was a highly significant affect of absolute time of sample ($Z=12.72$, $p<0.01$) on logged cortisol. As with the cross sectional analysis, time of sample since waking has no added explanatory power and so is not included. The correlation of mean cortisol values against time of sample are shown in graphs 4.7-4.9, there are three graphs, one for the morning samples, one for the afternoon samples and the third combining the two.

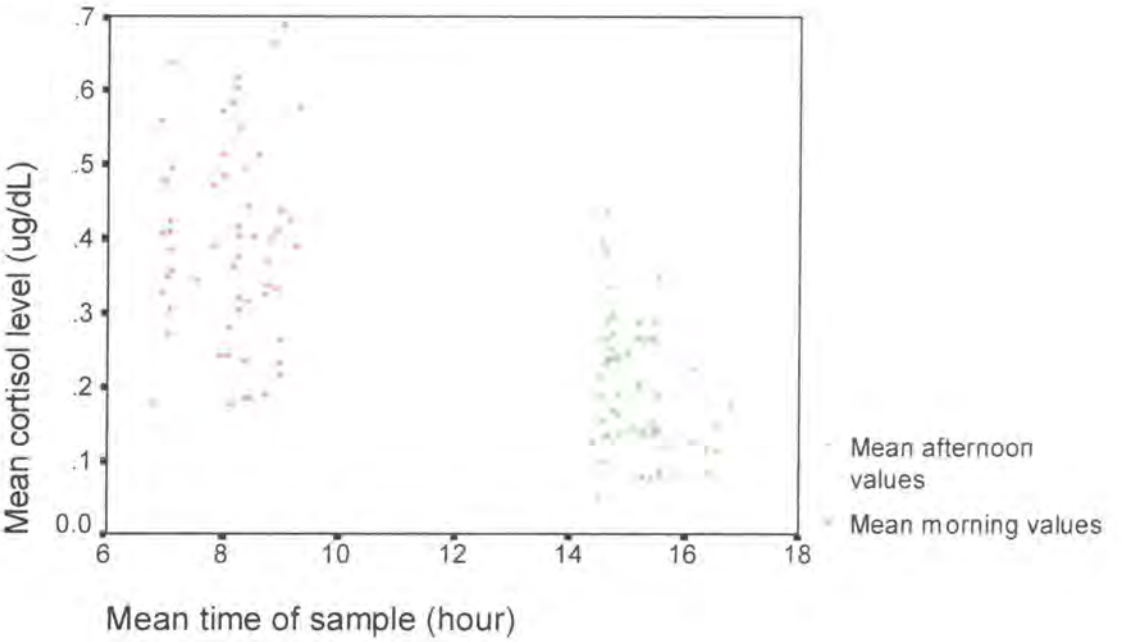
Graph 4.7. Mean cortisol level versus mean time of morning samples with children coded by lifestyle



Graph 4.8. Mean cortisol level versus mean time of afternoon samples with children coded by lifestyle



Graph 4.9. Correlation of mean cortisol value against mean time of sample



In the longitudinal phase, the children were asked about their day's activity either late in the evening of the day in question, or early during the morning of the following day. Although most of the children made considerable effort to recall their activity in detail, some became confused and many were unable to remember, for example, the exact time that events occurred. Data on when and what they had eaten or drunk cannot be deemed accurate enough to include in analysis (these data were not collected specifically but included more generally within the children's descriptions of their day). By contrast, in the cross sectional research, data on when the children last ate or drank was collected when they actually gave the saliva sample (these reported data are likely to be more accurate as they occurred nearer in time). The procedure used to correct for circadian rhythm was, for the longitudinal data, the same as for the cross sectional data, i.e. only correcting for absolute time of sample.

4.7.3b. Variability in cortisol profiles

The coefficient of variation is a measure of the spread for a set of data, it is used as a way of comparing the variability in different distributions independent of the mean. Here I use it to assess the variability of cortisol for each individual child, thereby characterising blunted or reactive hormone profiles. The coefficient of variation is calculated as follows:

$$\text{CV (coefficient of variation)} = \frac{\text{SD (standard deviation of means for each child)}}{\text{Mean (cortisol value for each child)}}$$

The most important potential confounding variable for this data set is the spread of the mean time of sample for each child (namely standard deviation). For example I must ensure that a child who shows a higher cortisol C.V. does not do so because the actual sample time each day varied more than for other children. The standard deviation (S.D.) of sample time is significantly different between lifestyle groups both for the morning samples ($F=11.60$, $df=(3,54)$, $p=0.0001$) and afternoon samples ($F=7.60$, $df=(3,54)$, $p=0.0002$). Thus this must be taken into account when comparing cortisol C.V. between lifestyle groups. An association of cortisol C.V. and the sample time S.D. was not significant for the morning samples ($r=0.07$, $p=0.6$), but was significant for the afternoon ($r=0.33$, $p=0.01$). Cortisol C.V. must therefore be corrected for sample time S.D. in further analysis. This is completed for both morning and afternoon data by saving the unstandardised residuals of a regression (cortisol C.V. against sample time S.D.); analysis is then conducted on these data representing cortisol C.V. corrected for variation in sampling time.

Examples of individual children showing a range of coefficients of variation and/or cortisol profiles are examined in more detail. The cortisol profiles are mapped against the children's reported activity over the six days. These data were collected for each day on the same evening or early the following morning. Combining these data provides individual profiles of cortisol levels for a small selection of children. When referring to specific children pseudonyms have been used throughout this thesis.

Chapter 5 - Results

5.1. ANTHROPOMETRY

5.1.1. Summary

There are overall differences between groups on all measures except for wasting. As expected the middle class children are taller and heavier for their ages, and show higher sums of skinfolds and larger mid upper arm circumference than the three disadvantaged groups of children. Street working children are less underweight and wasted, and have higher fat level and mid upper arm circumference than poor non street children, but do not differ in terms of stunting. Street living children have higher body fat level than poor non street children but do not differ on other measures. On no measure are there differences between street living and street working children. Girls faired better than boys for weight-for-age z-scores, sum of skin folds and upper arm circumference for all groups, for the three less privileged groups analysed alone, girls faired better than boys for weight-for-age and weight-for-height z-scores and for sum of skinfolds.

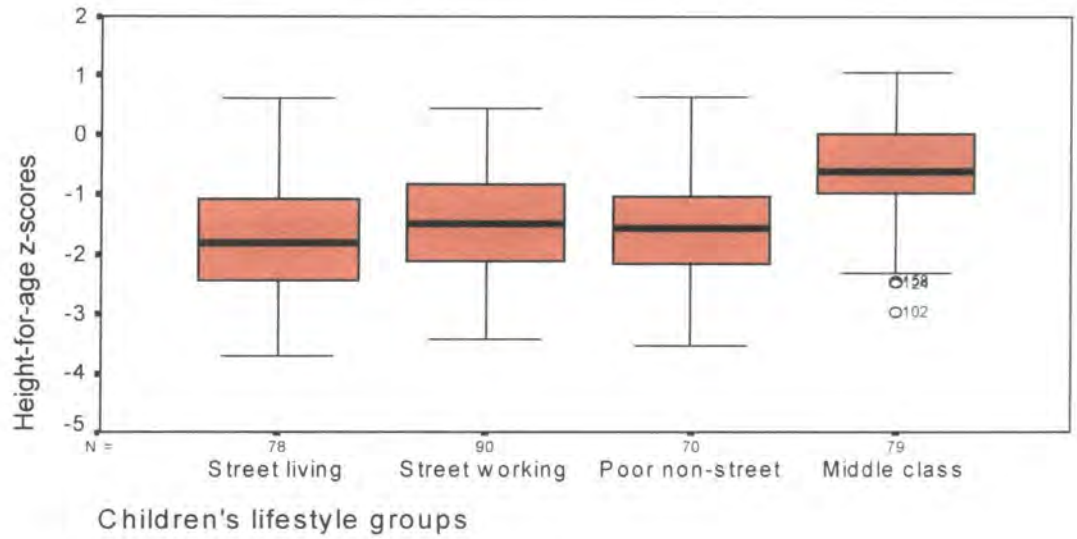
5.1.2. Growth status

Absolute height and weight data can be found in the appendices tables A26-28 and graphs A1-2. Below, table 5.1 and graphs 5.1-5.3 show growth data using z-scores standardised for age and sex, to compare lifestyle groups. Data for girls and boys are shown separately in appendices tables A29-30.

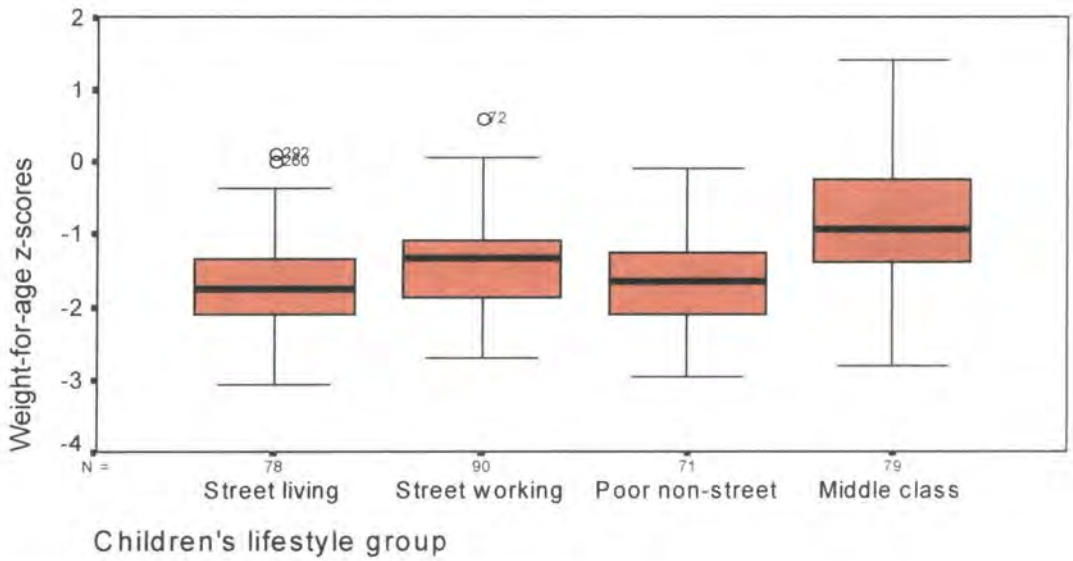
Table 5.1. Comparison of growth status by lifestyle group

Lifestyle group	Height-for-age z-score		Weight-for-age z-score		Weight-for-height z-score		Number
	Mean	S.D.	Mean	S.D.	Mean	S.D.	
Street living children	-1.76	0.85	-1.72	0.65	-0.72	0.61	78
Street working children	-1.42	0.84	-1.42	0.62	-0.62	0.66	90
Poor non-street children	-1.59	0.89	-1.66	0.63	-0.84	0.72	69
Middle class children	-0.56	0.83	-0.82	0.82	-0.62	0.92	75
All children	-1.32	0.92	-1.40	0.77	-0.70	0.74	312

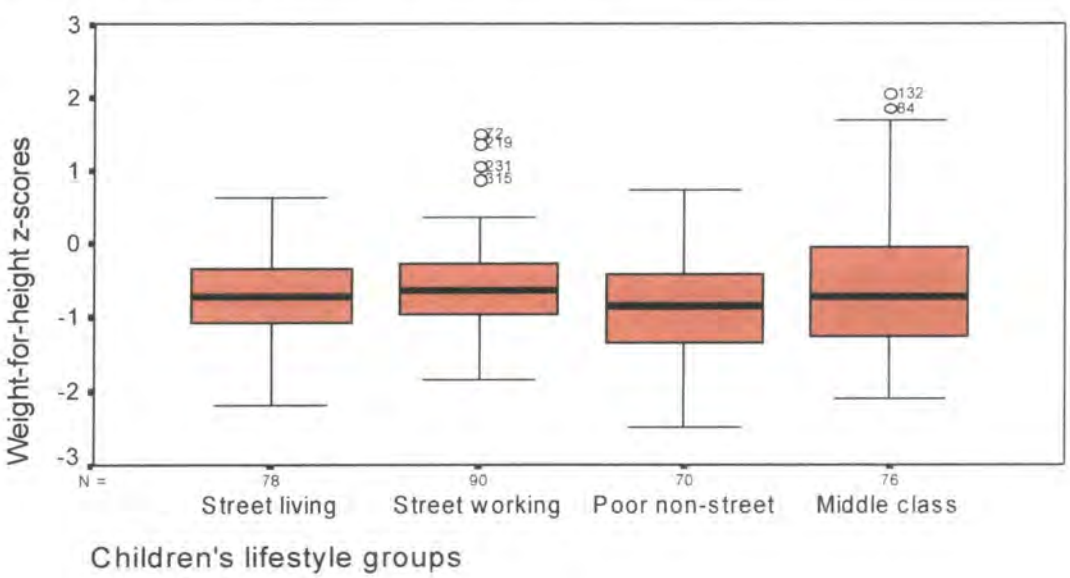
Graph 5.1. Height-for-age z-scores by lifestyle group



Graph 5.2. Weight-for-age z-scores by lifestyle group



Graph 5.3. Weight-for-height z-scores by lifestyle group



Z-scores include age and sex components in their calculation, however they further negatively correlate with age and are affected by sex (as discussed in chapter 4): with increased age the children become relatively more short and underweight as compared to the U. S. reference population. Notably males are significantly more wasted than females. The following analyses are conducted on z-scores corrected for age and sex, as described in the previous chapter.

There is a significant difference between lifestyle groups for HAz ($F=24.28$, $df=(3,313)$, $p=0.001$) and WAz ($F=23.01$, $df=(3,314)$, $p=0.001$), but not for WHz ($F=2.02$, $df=(3,310)$, $p=0.11$). These results are illustrated in the three graphs above with individual group differences detailed below.

Paired group analysis for z-scores (tables 5.2-5.4) show middle class children to be less stunted (HAz) and underweight (WAz) than each of the disadvantaged groups. Street working children have higher WAz and WHz than poor non-street children. There are no differences in WAz or WHz between street living children and either street working children or poor non street children. When the street living children and street working children are combined into one group they are significantly less underweight ($t=2.56$, $df=136$, $p=0.01$) and less thin ($t=2.35$, $df=114$, $p=0.02$) than the poor non street children.

Table 5.2. Paired lifestyle group differences in HAz

	Street living children	Street working children	Poor non-street children
Street living			
Street working	t=1.93, df=161, p=0.06		
Poor non-street	t=0.32, df=144, p=0.7	t=1.52, df=145, p=0.1	
Middle class	t=7.57, df=155, p=0.001	t=5.97, df=164, p=0.001	t=6.97, df=143, p=0.001

Table 5.3. Paired lifestyle group differences in WAz

	Street living children	Street working children	Poor non-street children
Street living			
Street working	t=1.68, df=158, p=0.1		
Poor non-street	t=1.3, df=147, p=0.2	t=3.10, df=150, p=0.002	
Middle class	t=5.90, df=144, p=0.001	t=4.81, df=135, p=0.001	t=7.05, df=139, p=0.001

Table 5.4. Paired lifestyle group differences in WHz

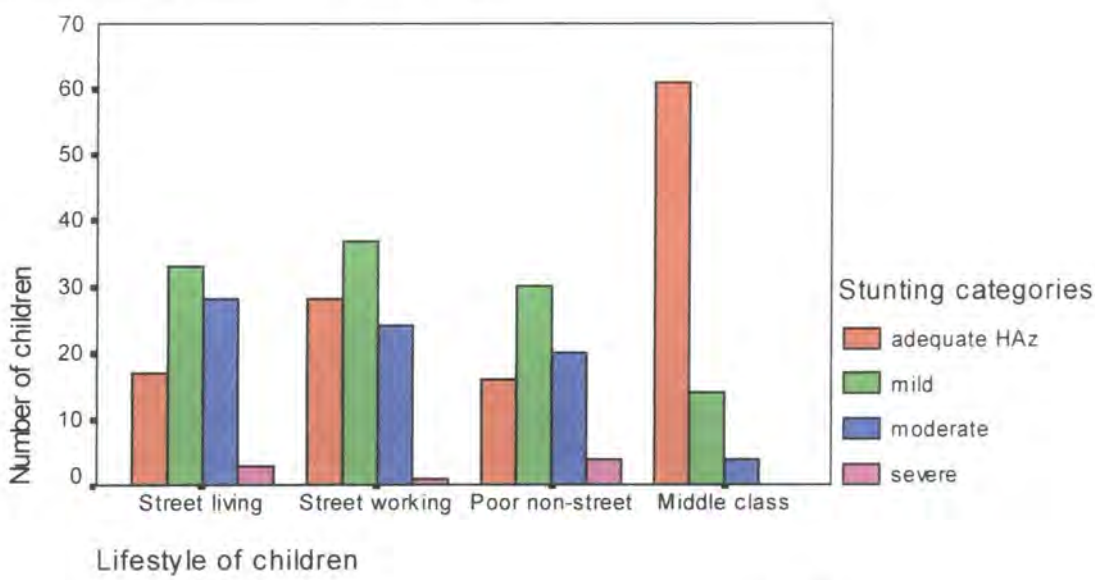
	Street living children	Street working children	Poor non-street children
Street living			
Street working	t=0.50, df=165, p=0.6		
Poor non-street	t=1.88, df=135, p=0.06	t=2.32, df=139, p=0.02	
Middle class	t=0.35, df=129, p=0.7	t=0.03, df=131, p=0.98	t=1.84, df=141, p=0.07

5.1.3. Growth impairment classifications

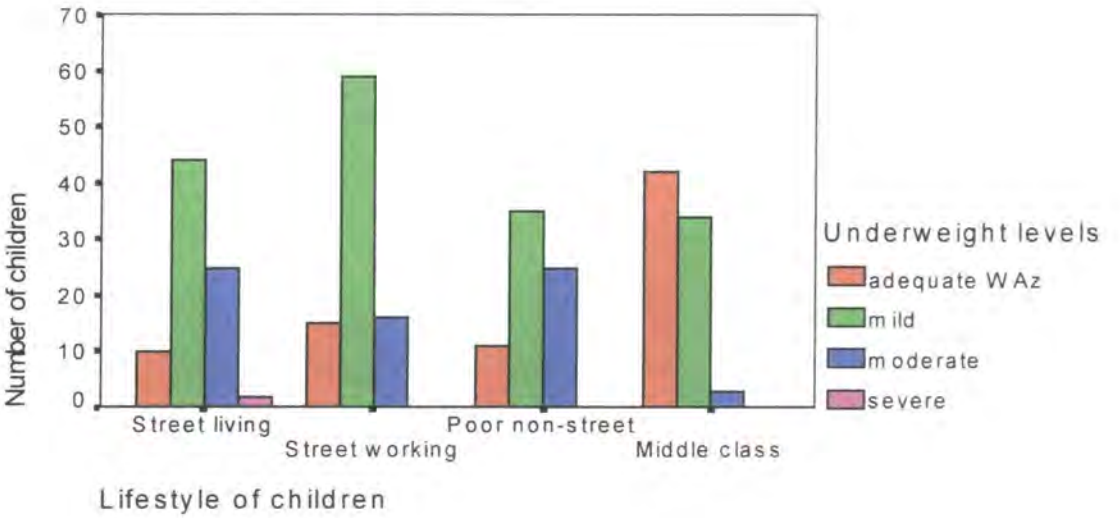
The main use of z-scores is to be able to assess quickly and easily children's growth status (for a discussion of z-scores see chapters two and four). Growth deficits for children under three standard deviations below the reference curve are severe (i.e. with a z-score of below -3), for those below two standard deviations below the reference curve are moderate (i.e. z-score below -2) and those below one standard deviation are mild (i.e. z-score below -1) (Hamill *et al.*, 1977, 1979). Graphs 5.4-5.6 show the children according to growth status classifications for each lifestyle group (these data are tabulated in appendices tables A29-39).

Street working children have higher proportions of adequate z-scores than the other two disadvantaged groups. There are no other clear or consistent relationships between the lifestyle groups and growth status in terms of mild, moderate or severe growth impairments.

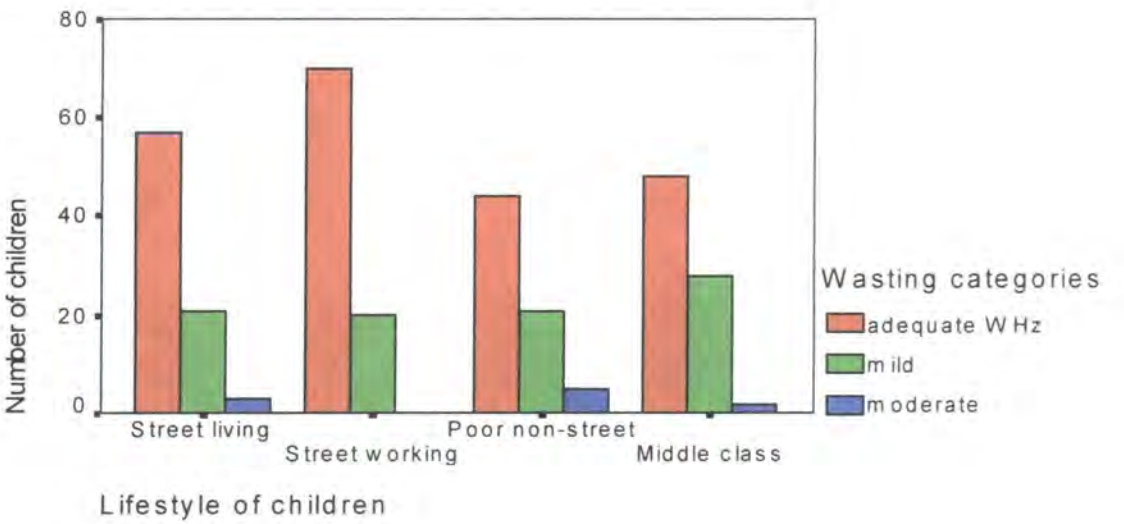
Graph 5.4. Stunting categories by lifestyle group



Graph 5.5. Underweight categories by lifestyle group



Graph 5.6. Wasting categories by lifestyle group



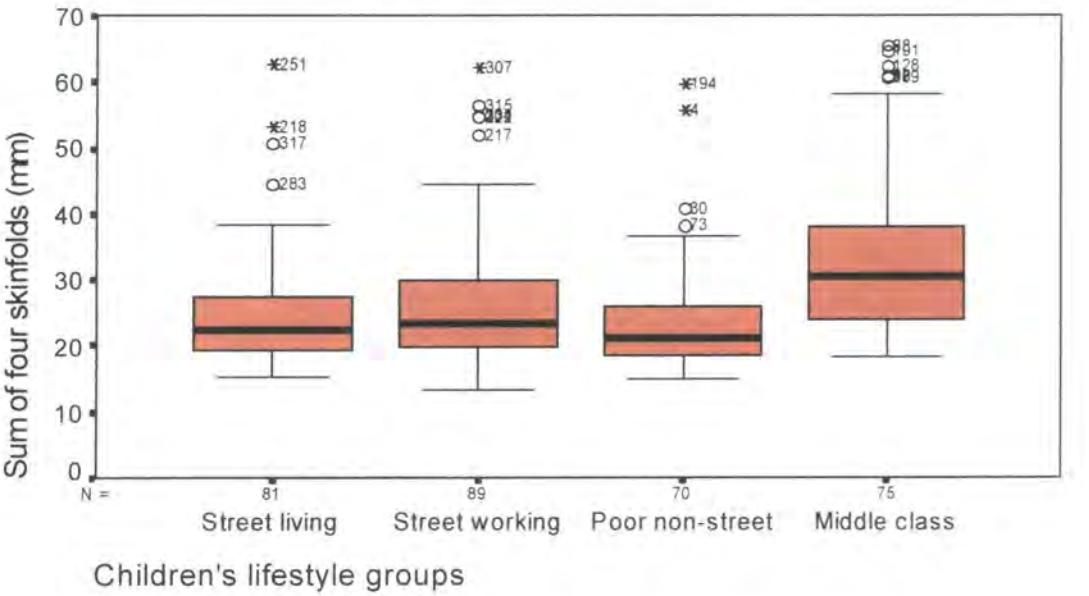
5.1.4. Body composition

Body composition was measured using sum of skinfolds (SSF) as an index of body fat, and mid upper arm circumference (MUAC), a combined measure of upper arm muscle and fat. These measures are closely correlated (r=0.73, p=0.001). Table 5.5 and graphs 5.7-5.8 compare absolute body composition between lifestyle groups, these data are tabulated by sex in appendices table A41-42. Tables 5.6-5.7 below show the statistical significance of paired group differences after controlling for age and sex.

Table 5.5. Mean body composition measurements

Lifestyle group	Sum of skinfolds, SSF (mm)		Mid upper arm circumference, MUAC (mm)		Number
	Mean	S.D.	Mean	S.D.	
Street living children	24.74	8.47	19.23	2.10	81
Street working children	26.80	10.78	19.31	2.20	89
Poor non-street children	23.62	8.17	18.49	2.16	70
Middle class children	33.43	12.66	20.22	3.20	75
All children	27.05	10.84	19.34	2.52	315

Graph 5.7. Sum of skinfolds by lifestyle group



Graph 5.8. Mid upper arm circumference by lifestyle group

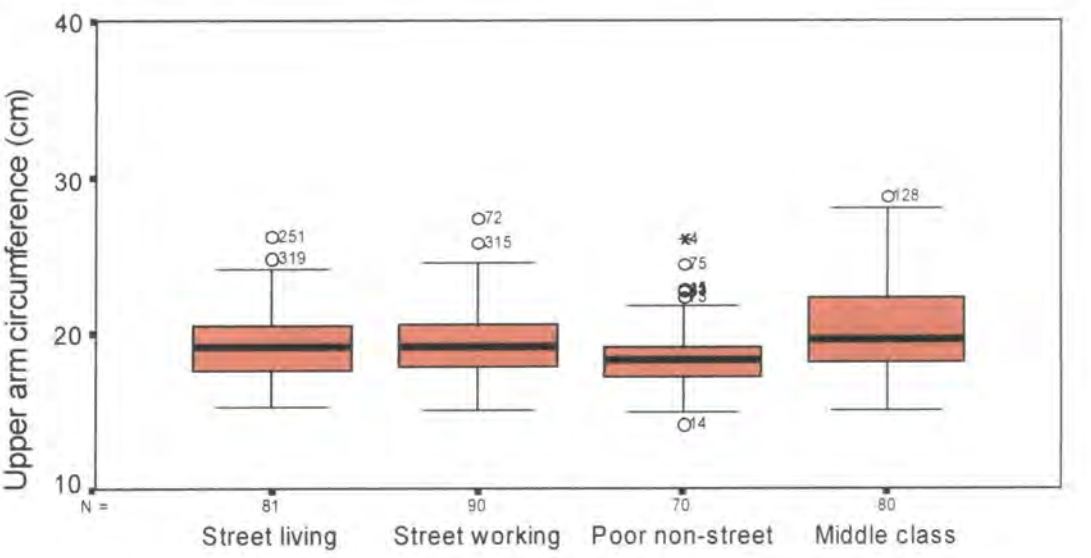


Table 5.6. Paired lifestyle group differences in sum of skinfolds

	Street living children	Street working children	Poor non-street children
Street living			
Street working	t=0.53, df=160, p=0.6		
Poor non-street	t=2.54, df=133, p=0.01	t=2.75, df=154, p=0.007	
Middle class	t=5.51, df=108, p=0.001	t=4.82, df=128, p=0.001	t=6.90, df=125, p=0.001

Table 5.7. Paired lifestyle group differences in mid upper arm circumference

	Street living children	Street working children	Poor non-street children
Street living			
Street working	t=0.85, df=165, p=0.4		
Poor non-street	t=1.43, df=142, p=0.2	t=2.25, df=144, p=0.03	
Middle class	t=4.89, df=130, p=0.001	t=4.35, df=127, p=0.001	t=5.78, df=137, p=0.001

In multiple regression analysis age and sex together account for 15.7% of the variation in SSF and 28.9% of the variance in MUAC. Significant differences for SSF and MUAC are found between the lifestyle groups with age and sex as covariates (SSF: F=23.13, df=(3,309), p=0.0001, UAC: F=17.14, df=(3,315), p=0.0001). Paired group analysis (tables 5.2-5.3) indicates that children from the middle class group have significantly more body fat and muscle than each of the disadvantaged groups. That such results are obtained despite excluding a number of outliers in the middle class group with large skinfolds, increases confidence in these differences. Street working children have significantly larger MUAC than poor non-street children. Street working and living children each have higher body fat levels than poor non-street children. When combined the two street children groups together have significantly larger SSF and MUAC than the poor non-street group (SSF: t=3.00, df=127, p=0.003, MUAC: t=2.09, df=121, p=0.04).

5.2. Cross Sectional Cortisol

Cross sectional results are presented first, followed by longitudinal data. As a reminder, for both the cross sectional and longitudinal data "logged cortisol residuals" refers to logged cortisol values corrected for circadian rhythm (absolute time of sample).

5.2.1. Mean cortisol

Absolute cortisol data are presented for samples taken in the morning and afternoon separately (tables 5.8-5.9). To give a feel for the data, tables A42-47 in the appendices

show these data for each sex separately. As expected logged cortisol morning values (taken before midday) are significantly higher than afternoon samples (t=3.64, df=319, p=0.001).

Table 5.8. Absolute cortisol level means for samples collected in the morning by lifestyle group

Group	AM cortisol (μg/dL)			Time since waking (hr:min)		Time of sample (hr:min)		No.
	Mean	S.D.	Median	Mean	S.D.	Mean	S.D.	
Street living	0.208	0.149	0.162	2:35	1:12	10:03	0:55	35
Street working	0.221	0.110	0.197	3:03	2:29	10:20	0:46	52
Poor non-street	0.241	0.116	0.215	3:06	1:19	09:56	0:56	29
Middle class	0.200	0.114	0.190	3:31	0:58	10:41	0:49	46
All children	0.216	0.122	0.196	3:05	1:17	10:19	0:53	162

Table 5.9. Absolute cortisol level means for samples collected in the afternoon by lifestyle group

Group	AM cortisol (μg/dL)			Time since waking (hr:min)		Time of sample (hr:min)		No.
	Mean	S.D.	Median	Mean	S.D.	Mean	S.D.	
Street living	0.167	0.087	0.155	07:55	1:28	15:01	0:48	46
Street working	0.149	0.066	0.136	07:52	1:35	15:19	1:09	38
Poor non-street	0.195	0.103	0.198	07:31	1:30	14:45	1:19	42
Middle class	0.161	0.087	0.147	07:19	0:57	14:18	0:47	34
All children	0.169	0.088	0.161	07:40	1:26	14:52	1:05	160

Logged cortisol residuals are analysed for group differences between lifestyle groups (table 5.10), with boys' and girls' data presented separately in appendices tables A46-47. There is a difference approaching significance between the four lifestyle groups (F=2.27, df=(3,318), p=0.08) for logged cortisol residuals, shown in graph 5.9 below. The pattern shows poor non street children to have the highest mean cortisol level, followed by street working and then street living children, with middle class children showing the lowest level. Poor non street children have significantly higher mean cortisol level than each of the other three groups.

Table 5.10. Logged cortisol residual means by lifestyle group, with paired lifestyle group differences for all children

Lifestyle group	**Logged cortisol residual value**	**S. D.**	**No.**	Street living children	Street working children	Poor non-street children
Street living	-0.041	0.590	81			
Street working	-0.018	0.562	90	t=0.27, df=165, p=0.8		
Poor non-street	0.145	0.470	71	**t=2.17, df=149, p=0.03**	**t=2.01, df=158, p=0.047**	
Middle class	-0.067	0.545	80	t=0.29, df=158, p=0.8	t=0.58, df=167, p=0.6	**t=2.57, df=149, p=0.01**
All children	0.000	0.550	322			

Graph 5.9. Logged cortisol residuals by lifestyle group

5.2.2. Anthropometry and cortisol

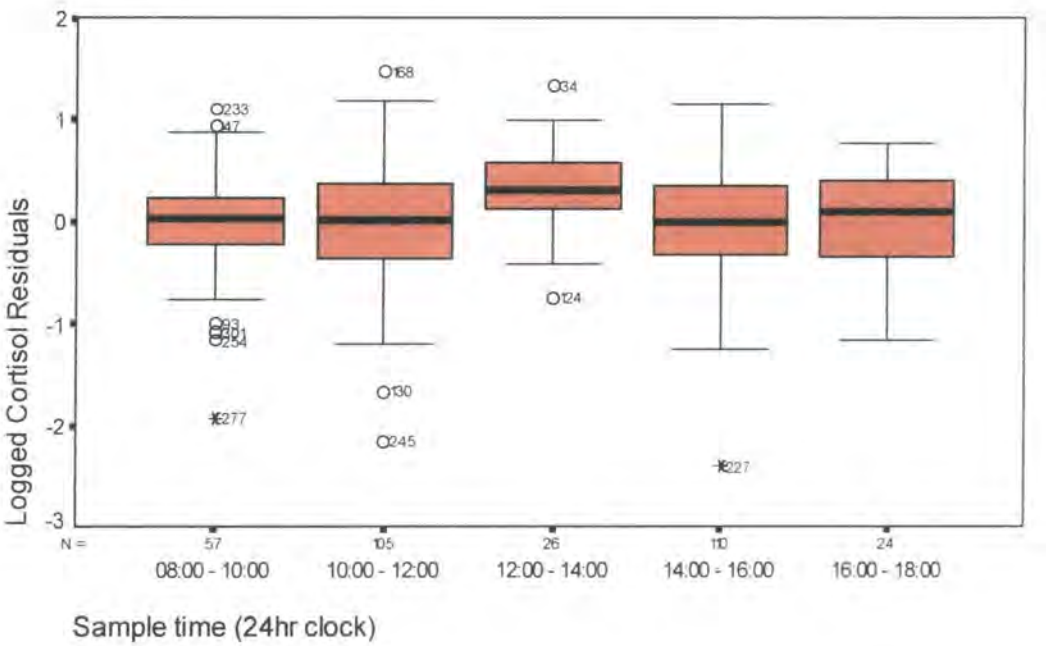
Logged cortisol residual values for cross sectional cortisol samples do not correlate significantly with any anthropometric variable; namely height-for-age z-scores (r=0.016, p=0.8), weight-for-age z-scores (r=0.02, p=0.7), weight-for height z-scores (r=0.006, p=0.9), sum of skinfolds (r=-0.02, p=0.7 or upper arm circumference (r=0.02, p=0.7.

5.2.3. Within day variation in cortisol

Cross sectional logged cortisol residual values have been analysed according to time of sample. In analysis of two hour periods throughout the day overall group differences

were found in logged cortisol residuals (F=2.75, df=(4,317), p=0.03). Graph 5.10 shows logged cortisol residuals for two-hourly intervals of samples: there is a peak at around noon. Cortisol levels during the period 12:00-14:00 were found to be higher than at any other time interval (t=4.06, df=33, p=0.001). There was no similar variation in two-hourly periods from waking (F=1.52, df=(5,315) p=0.2), suggesting that there is a definite effect of the lunch time period. Since logged cortisol residuals are already controlled for circadian rhythm, this finding may be associated with post prandial effects in a non linear fashion, or alternatively point to other variables (e.g. a daily rise in psychosocial stress) associated with this time period. The difference was analysed group by group to identify if it was stronger in any one lifestyle group. Logged cortisol residuals for the time period 12:00-14:00 were significantly higher than other time periods in all lifestyle groups except street living children.

Graph 5.10. Logged cortisol residuals by absolute time of sample



5.3. ANTHROPOMETRY AND CORTISOL BY LIFESTYLE AND BACKGROUND CHARACTERISTICS

5.3.1. Birthplace

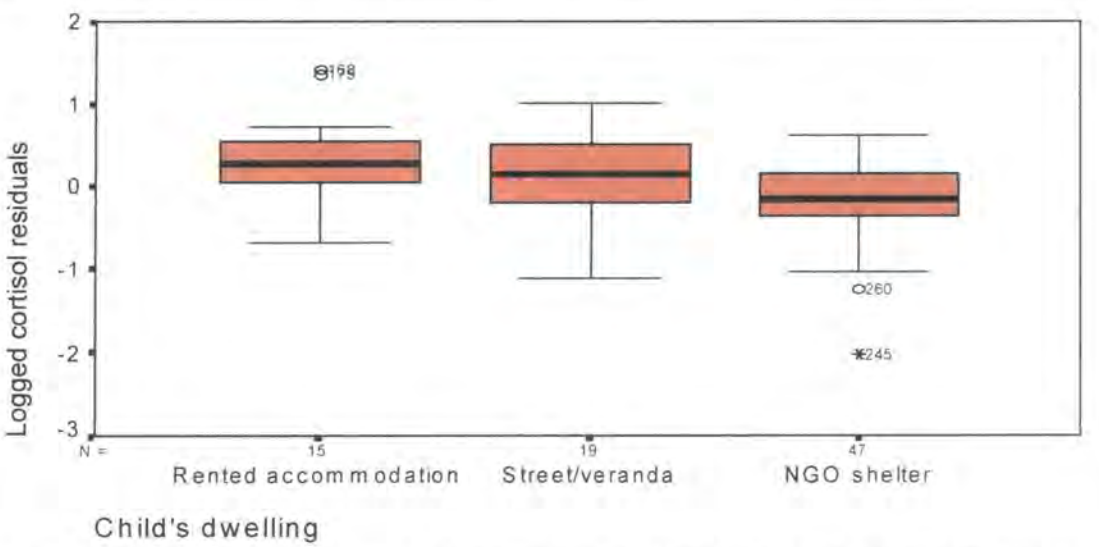
Statistical tests on street living children, where proportions of different birth places are more evenly distributed, show no group differences in any anthropometric variables or

logged cortisol residuals depending upon whether street living children were born in Addis Ababa, or are migrants from rural or urban places.

5.3.2. Current dwelling

Among street living children, 58% currently live in NGO shelters, with 24% actually sleeping on the street (veranda dwelling) and 19% living in rented accommodation. Children reported what kind of accommodation they currently live in most of the time. This, of course, may not be permanent, no data are available showing the length of time the child reports living in the reported type of shelter. It is important to test whether the large number of NGO living children in this sample mis-represents street living children in Addis Ababa in general. Street living children are analysed in three groups depending upon in which kind of shelter they live. Analysis showed no significant difference in any anthropometric measures. However there is a significant difference in logged cortisol residuals ($F=7.74$, $df=(2,78)$, $p=0.0009$, graph 5.1). More detailed analysis show NGO dwelling street living children to have significantly lower cortisol levels than those living in rented accommodation ($t=3.38$, $df=22$, $p=0.003$), or veranda dwellers ($t=2.59$, $df=31$, $p=0.01$). This result is difficult to interpret considering the small number of children in the groups. Many reasons could be suggested, e.g. NGO dwelling street children may perceive their shelter as more secure if higher cortisol levels are taken to indicate higher psychosocial stress.

Graph 5.11. Logged cortisol residuals against type of dwelling for street living children only



NB As a reminder, the outlying cortisol value from a child living in the NGO shelter is included in analysis since it is within the normal range of cortisol values from the second phase.

5.3.3. Family background

There are no significant differences between children on the basis of either ethnicity or religion for any anthropometric measurement. These tests ensure that potential differences between the four lifestyle groups in ethnicity (genetics) or religion (beliefs and behaviour affecting well-being) are not responsible for any differences in anthropometry found.

Within the three less privileged groups, in terms of anthropometry measures and logged cortisol residual values, there are no significant differences between children who do or do not live with their mother and father. Nor are there differences for these children between those with both parents alive, one dead or both dead. There are no differences either according to whether the family is intact or not, nor how old the child was when the nuclear family broke up.

Analysing the three less privileged groups only using analysis of variance, there are no differences in anthropometry between the eldest, middle, youngest or only children within a family. Comparing children with few siblings (0, 1 or 2) and children with several siblings (3 or more), children with more siblings have significantly higher HAz ($t=2.58$, $df=35$, $p=0.01$) and significantly smaller SSF ($t=2.50$, $df=39$, $p=0.02$) and UAC ($t=2.16$, $df=38$, $p=0.04$), however there is no difference in logged cortisol residuals.

For the street living and working children, there is no difference in anthropometric or cortisol measures comparing children with siblings who work against those with no siblings who work (despite being of appropriate age). It therefore appears that sibling's working behaviour and the subsequent likely increase in a household's income is not reflected in growth measures for the index child.

5.3.4. Current (street) life

For street living children alone, and also for all street children, reported earnings are not found to correlate with any anthropometric variable or logged cortisol residuals, nor are any group differences found between those children who reported receiving gifts in kind and those who did not.

An important way to assess the impact of living on the street is to correlate the effect of the time the child has been on the street with different outcome measures. No significant correlations are found on any anthropometric or cortisol measure; nor are significant group differences found when the children are divided into four groups according to their time on the street (less than one year, one year, two or three years, and four or more years). Unfortunately, data are not available for the time that street working children had been working on the street.

None of the following variables has any effect on anthropometric measurements or logged cortisol residuals within the three less privileged groups: current illness; perceived family or peer support ratings; who the children felt controlled their lives; or, present or past bullying. Additionally, neither anthropometry nor logged cortisol residuals correlated with children's reported happiness with life in general (for logged cortisol residuals, $r=-0.06$, $p=0.3$) or with how good they rated the current day (for logged cortisol residuals, $r=-0.07$, $p=0.2$).

5.3.5. Summary

From the ethnographic data analysed, several potential explanatory factors for biological outcome variables can be overruled. In fact, having considered urban migration and family composition (the latter being likely to closely reflect childhood household environment), the only differences found in anthropometry are that children with fewer siblings have significantly higher HAz, and lower UAC and SSF scores. Also that for poor non street children when their siblings work on the street they have higher UAC and WHz scores. No differences due to past lifestyle were found in cortisol measures.

In terms of current factors (primary street job, earnings, gifts in kind, time on street, problems, family and peer support, happiness with life and current day, and control over life) no variables appear to effect anthropometry. However current dwelling has an effect on logged cortisol residuals for street living children, with those who live in NGO shelters showing significantly lower cortisol levels than veranda dwellers or those living in rented accommodation.

The overall lack of effect of most factors affecting past and present lifestyle goes some way to highlighting the complex nature of the term lifestyle. Lifestyle consists of numerous aspects, it is all these acting together in a complex and interwoven manner that creates the totality of lifestyle. The analysis of ethnographic data suggests that where differences in anthropometry and cortisol measures between lifestyle groups are found, they are due to the whole phenomenon of lifestyle which is more encompassing than all its parts.

5.4. LONGITUDINAL CORTISOL

5.4.1. Mean cortisol

After adjusting for time of sample, there is a highly significant difference in mean cortisol level between lifestyle groups (MLN: $X^2_{(3)}=33.27$, $p<0.001$). These differences are shown in graph 5.12, showing the mean per lifestyle group of the means of each child; the graph data are unadjusted for circadian rhythm but it does illustrate the differences found. Further detail is presented below (tables 5.11-5.12) and in the appendices (tables A48-51). Overall the street working and poor non street children show significantly higher cortisol levels (logged and corrected for circadian rhythm) relative to the street living and middle class children (table 5.13). The longitudinal mean cortisol data show a similar, though not identical, pattern to the cross sectional data; both data sets are logged and corrected for circadian rhythm (table 5.14). The higher and lower pairs remain the same two groups in each case, but swap position within the two pairs.

Graph 5.12. Cortisol (absolute values) by lifestyle group

Table 5.11. Absolute cortisol level means for samples collected in the morning by lifestyle group

Lifestyle group	**AM cortisol (μg/dL)**			**Time since waking (hr:min)**		**Time of sample (hr:min)**		**Number**	
	Mean	S.D.	Median	Mean	S.D.	Mean	S.D.	samples	kids
Street living	0.388	0.122	0.371	0:52	0:11	7:31	0:51	112	19
Street working	0.424	0.146	0.418	1:48	0:31	8:46	0:25	81	14
Poor non-street	0.474	0.110	0.442	1:38	0:11	8:25	0:17	53	9
Middle class	0.329	0.119	0.330	1:19	0:36	8:08	0:15	86	16
All children	0.394	0.132	0.389	1:20	0:34	8:08	0:44	332	58

Table 5.12 . Absolute cortisol level means for samples collected in the afternoon by lifestyle group

Lifestyle group	**PM cortisol (μg/dL)**			**Time since waking (hr:min)**		**Time of sample (hr:min)**		**Number**	
	Mean	S.D.	Median	Mean	S.D.	Mean	S.D.	samples	kids
Street living	0.164	0.101	0.131	8:42	1:33	15:21	0:53	112	19
Street working	0.246	0.075	0.263	7:55	0:37	14:53	0:16	77	14
Poor non-street	0.215	0.044	0.213	8:04	0:21	14:49	0:13	44	9
Middle class	0.174	0.080	0.142	8:42	0:35	15:32	0:12	51	16
All children	0.194	0.087	0.181	8:25	1:02	15:12	0:37	314	58

Table 5.13. Paired lifestyle group differences in mean longitudinal cortisol data (logged and corrected for circadian rhythm)

	Street living children	Street working children	Poor non-street children
Street living			
Street working	$z=6.12$, $p<0.05$		
Poor non-street	$z=3.19$, $p<0.05$	Not significant	
Middle class	Not significant	$z=4.5$, $p<0.05$	$z=2.7$, $p<0.05$

Table 5.14. Comparing cross sectional and longitudinal phase cortisol data

	Cross sectional phase (322 samples from 322 children)	**Longitudinal phase** (646 samples from 58 children)
Highest cortisol level	Poor non street	Street working
↓	Street working	Poor non street
↓	Street living	Middle class
Lowest cortisol level	Middle class	Street living

5.4.2. Daily variables

Daily activity data were collected, these are discussed later using cortisol profiles of selected children. Children's daily ratings on a scale of one to five of how good that day was and how worried they felt in general did not correlate with morning or afternoon cortisol levels.

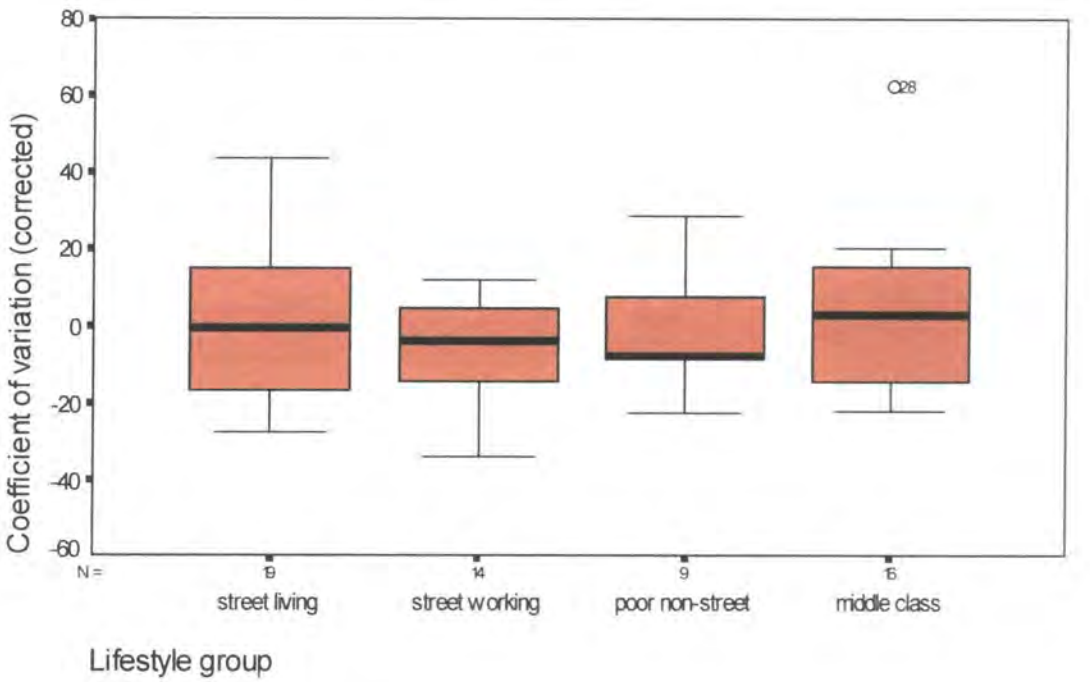
5.4.3. Variability of cortisol within children

There is an overall difference between lifestyle groups for the coefficient of variation of cortisol for afternoon samples ($F=4.97$, $df=(3,54)$, $p=0.004$), but not for morning samples ($F=0.57$, $df=(3,54)$, $p=0.6$). These results are corrected for differences in spread of time of samples (standard deviation of sample collection time for each child averaged per lifestyle group). These data can be seen in table 5.15 (separated by sex in tables A53-54) and graphs 5.13-5.14 (the data in the graphs and all calculations is corrected for spread of collection time). There are no differences between any pair of groups for morning coefficient of variance. However the coefficient of variation for the afternoon is significantly lower in street working children than each of the other three groups (table 5.16). There are no significant differences in CV between males and females for the morning ($t=0.64$, $df=46$, $p=0.5$) or for the afternoon ($t=0.06$, $df=49$, $p=0.95$).

Table 5.15. Coefficient of variation in cortisol (absolute values uncorrected for variation in time of sampling)

Lifestyle group	Morning			Afternoon			Number of children
	Mean	Minimum	Maximum	Mean	Minimum	Maximum	
Street living	45	17	88	64	24	97	19
Street working	41	11	57	38	11	77	14
Poor non street	45	26	75	55	39	77	9
Middle class	51	25	59	67	18	113	16
All children	46	11	88	57	11	113	58

Graph 5.13. Coefficient of variation by lifestyle group for morning cortisol samples



Graph 5.14. Coefficient of variation by lifestyle group for afternoon cortisol samples

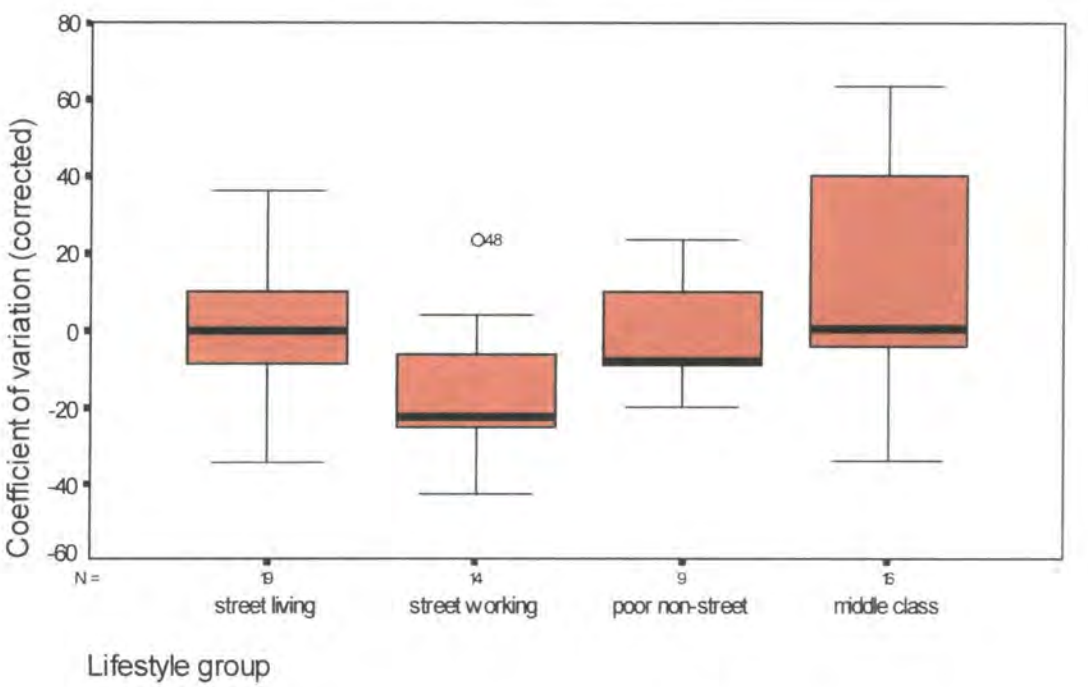


Table 5.16. Paired lifestyle group differences in afternoon coefficient of variation

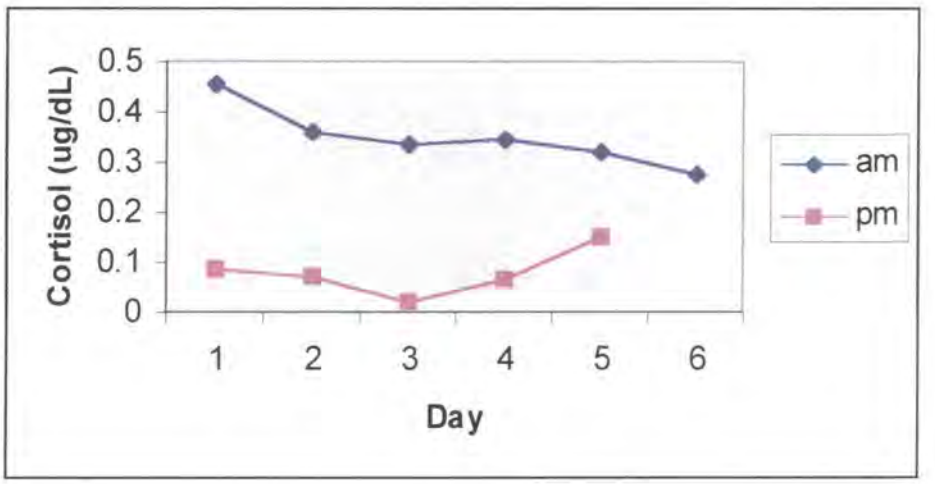
	Street living children	Street working children	Poor non-street children
Street living			
Street working	t=2.72, df=26, p=0.01		
Poor non-street	t=0.24, df=17, p=0.8	t=2.18, df=20, p=0.04	
Middle class	t=1.59, df=22, p=0.1	t=3.35, df=25, p=0.003	t=1.65, df=23, p=0.1

5.4.4. Cortisol profiles

Children with particularly high or low variability in cortisol or interesting profiles were identified and examined further. Profiles of cortisol level were drawn and are presented below, each graph shows one line over the six study days for morning cortisol (blue with diamond points) and a second line for afternoon cortisol (pink with square points). A brief vignette is provided with each profile, describing a little of each child's reported lifestyle background and daily activity during the study period. An expected profile would show similarly high cortisol for each morning sample and similarly low cortisol value for each afternoon sample. The first child described follows approximately this pattern, he has a relatively low morning coefficient of variation and an average afternoon coefficient of variation. Relatively Tsegaye's average morning cortisol is slightly low and the afternoon value very low compared both to mean values for his lifestyle group and the whole sample.

Tsegaye

Street living 13 year old male
Average cortisol: am - 0.349μg/dL
pm - 0.078μg/dL
Coefficient of variation: am - 17%
pm - 61%

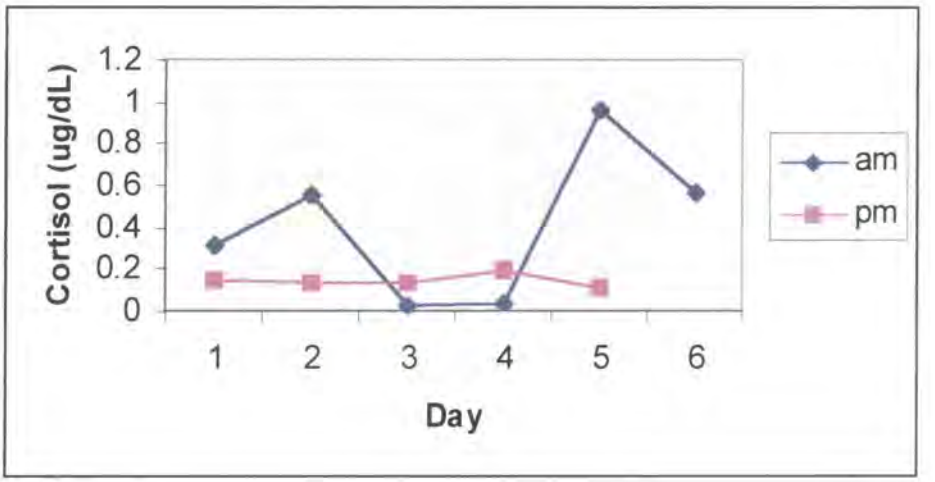


Tsegaye lives in an NGO shelter with 20 other street boys. Tsegaye's mother died three years ago. He tried to live with his father, a beggar, but was eventually thrown out. Tsegaye has a younger brother who still lives at home with his father who carries goods on the street to earn money. Tsegaye currently goes to school and is in grade one. He reports working six hours each day on the streets, mainly begging and carrying goods, for which on average he earns 2-3 birr. Tsegaye prefers the streets, stating that it is a better life for him than at home. During the study period, Tsegaye went to school for the first four days in the morning. He bought lunch at the NGO drop in centre where he stayed for a while each day playing, before he headed to work on the streets. The fifth day was a Saturday, Tsegaye played football in between working and on the sixth day, Sunday, he enjoyed entertainment held at a local school for "street children's day".

Yemariamwok

Street living 13 year old female
Average cortisol: am - 0.408 μg/dL
pm - 0.143μg/dL

Coefficient of variation: am - 88%
(highest am CV for street living children)
pm - 22%
(lowest pm CV for street living children)

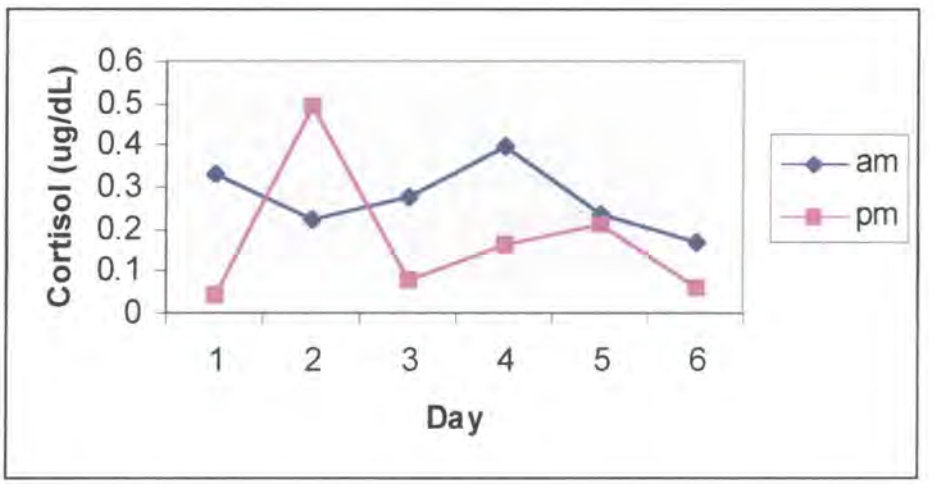


Yemariamwok has been on the streets for 5 years. Her father died when she was three years old. When she was 8 her mother, who begs for a living, was too poor to be able to support Yemariamwok herself, so she sent Yemariamwok to the NGO centre where she still lives. Yemariamwok continues to have considerable contact with her mother and often begs with her during the day. Yemariamwok reports earning on average 3 birr for 6 hours work each day. Yemariamwok attends school and is currently in grade one. During the study, in the morning of the first four days Yemariamwok attended school and then went to the drop in centre for lunch. On days one and two, she stayed there a while doing embroidery and studying. On the third day she reported being upset in the afternoon whilst she was begging. On the fourth day she visited her mother and was hit by other children while she was begging. Yemariamwok has very low morning cortisol levels on days three and four. The fifth day was a Saturday, note the high morning cortisol level, Yemariamwok begged in the morning, watched a video at the NGO drop in centre and then visited her mother. The sixth day was spent begging.

Yonas

Street living 12 year old male
Average cortisol: am - 0.271μg/dL
pm - 0.175μg/dL

Coefficient of variation: am - 30%
pm - 97%
(highest pm CV for street living children)

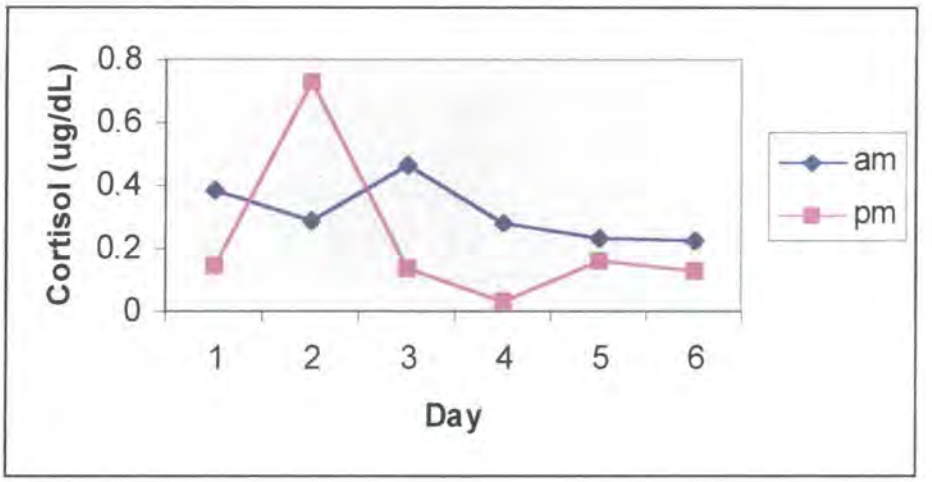


Yonas lives in an NGO shelter. Three years ago he left his parents after his father kicked him as punishment for lying to him. Currently Yonas is in grade 2 at school. He reports spending six hours each day working on the street where he earns about 2 birr by selling chewing gum and cigarettes. During the time of the study, Yonas had just managed to secure a job in a local café, the Ghion, where he cleared tables and did other odd jobs as needed. As he attended school each morning, the Ghion agreed that he could work each afternoon with them. Yonas attended school each morning for the first four days of the study. On the first day he was worried about having lost his exercise book at school, after having lunch he went to the Ghion where he was given clothes to wear for work. The second day was Yonas' first day working at the Ghion, he was very worried about this (note the particularly high afternoon cortisol value). On the third day Yonas went to school, he had lunch and watched a video at the drop in centre and then went to work at the Ghion. The same occurred on the fourth day except Yonas played table tennis instead of watching a video. On the fifth day Yonas was on duty at the shelter which involves getting up early and collecting water, Yonas has a particularly low morning cortisol value on this day compared to the other days. As this was a Saturday, Yonas played football before going to work at the Ghion, he was hit by older boys in the evening. On the last day Yonas spent the day with his friends at the celebrations for street children day.

Helson

Middle class 14 year old female
Average cortisol: am - 0.314μg/dL
pm - 0.222μg/dL

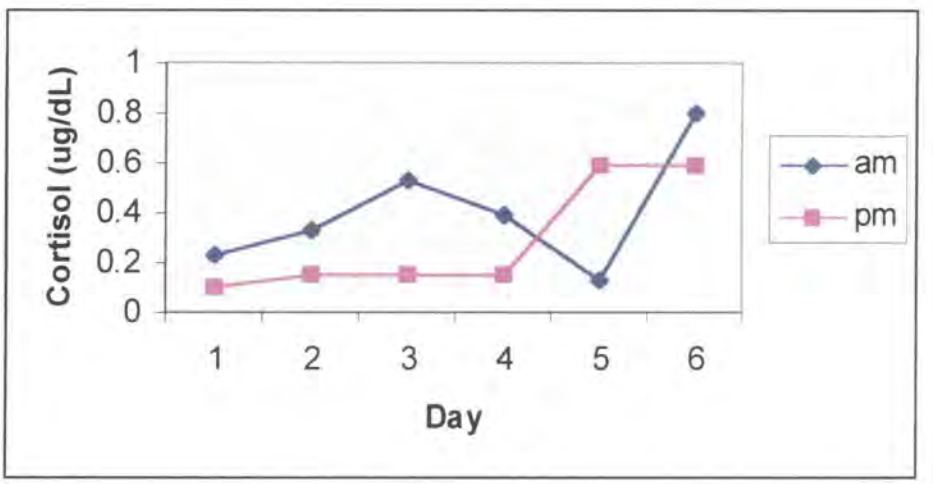
Coefficient of variation: am - 30%
pm - 113%
(highest pm CV for all children)



Helson lives with both her parents, she has two older brother, one who has a degree and the other is in grade 12, along with two younger sisters both of whom attend school. Helson's mother works in their shop and has been to university, her father is a teacher and completed year 12. Helson attends the private school and also helps out in the shop when she can. On the first day she had exams at school, she stayed the night at a friends house and got a letter from her cousin. On the second day she got money from her aunt who lives in Canada (note he very high afternoon cortisol value that day). On the fifth day Helson bought clothes with he money from her aunt after school, it was the first time she had bought her own clothes. Helson spent the sixth day, a Saturday, at a friend's house.

Michael

Middle class 10 year old male
Average cortisol: am - 0.404μg/dL pm - 0.287μg/dL
Coefficient of variation: am - 59% pm - 82%

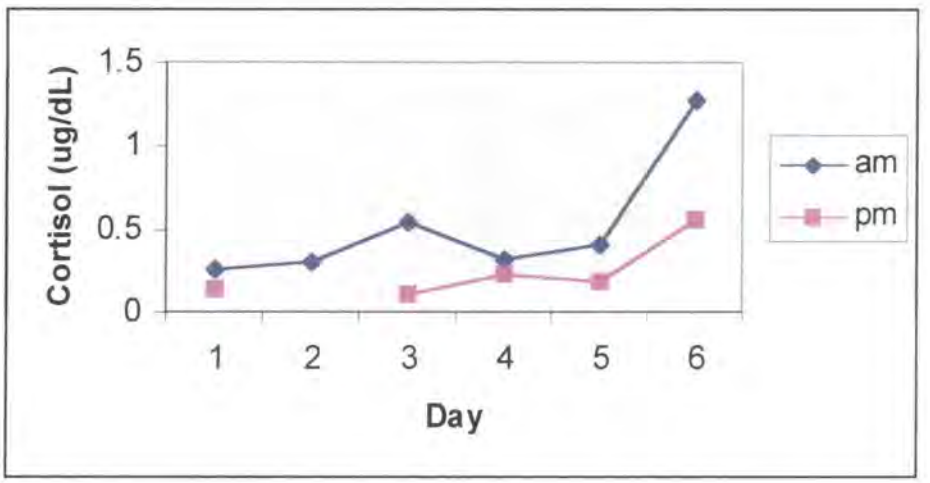


Michael lives with both his parents, he has two older sisters both of whom passed grade 12; one now lives in the USA. His father owns a garage and his mother is a trader. Michael has a private tutor at home. His basic day consists of going to school from 8am to 3.30pm, returning home to complete his homework sometimes with the help of his father, he watches television in the evening before going to bed. On the evening of the third day his father was late to collect him from school which meant he missed watching a video, this upset him. On the fifth day Michael receives the results from a test which are not good (note the low cortisol level that morning before receiving the results and the very high cortisol that afternoon). That evening his father beat him for getting poor results. Michael has high cortisol values on Saturday which he spent watching television and playing football with friends.

Abeba

Poor non street 11 year old female
Average cortisol: am - 0.514μg/dL
pm - 0.237μg/dL

Coefficient of variation: am - 75%
(highest am CV for poor non street children)
pm - 77%
(highest pm CV for poor non street children)

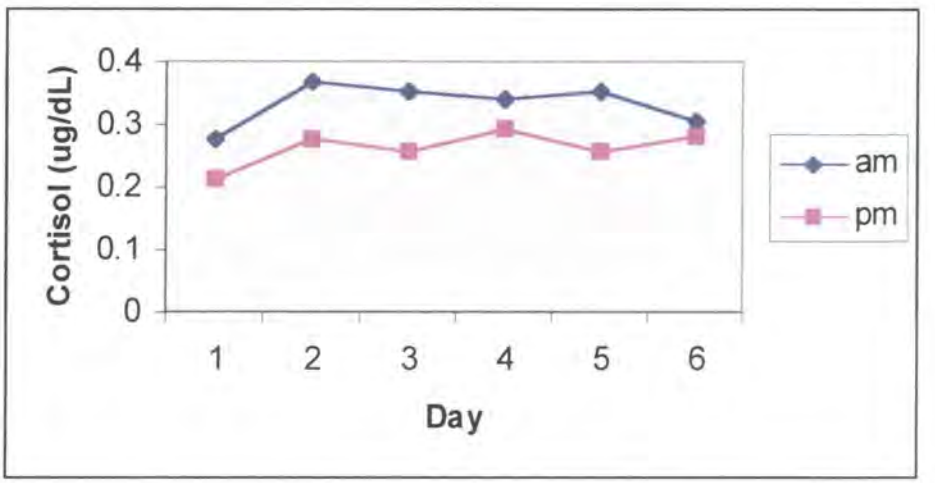


Abeba has four siblings aged between 4 and 20 and 3 step siblings. Both her mother and father were educated to grade 12 level. Her father now lives in the USA and her mother is a housewife. On the first day of the study Abeba went to school in the morning, she went home for lunch and then went to her grandfather's house, she returned home late in the afternoon where she helped her mother with the cooking, ate dinner and went to bed. On the second day Abeba went to school, she returned home for lunch after which she made coffee with her mother and then spent the afternoon washing clothes and helping her mother who was sick that day. The third day was Christmas, Abeba stayed at home watching television and playing with her sister. On the fourth and fifth days Abeba attended school in the morning, she went home for lunch and then returned to school to play with her friends, she studied at home later in the evening. On the sixth day Abeba went to her uncle's house with her mother and sister, she played there all afternoon. Note the high morning and afternoon cortisol values on this last day.

Meselet

Street working 10 year old female
Average cortisol: am - 0.333μg/dL
pm - 0.263μg/dL

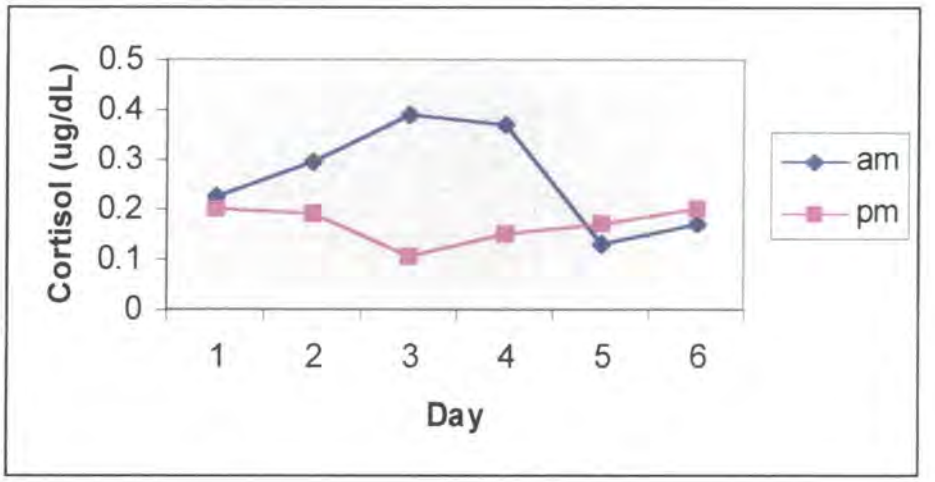
Coefficient of variation: am - 11%
(lowest am CV all children)
pm - 11%
(lowest pm CV for all children)



Meselet lives with her aunt, her parents are still together but live in a different town with her four sisters and one brother. Meselet's father is a farmer and her mother is a housewife. Meselet spends one and a half hours each day selling potatoes on the street, she earns approximately 1.5 birr which she gives to her aunt. Meselet is in grade 5 at school. Meselet's normal day during the study was to play with friends at the NGO drop in centre, return home to her aunt's for lunch, attend school, return home to help her aunt in the house, study, eat dinner and go to bed. On the first day of the study Meselet was very happy as she had received some money from her sponsor. On the third day she heard that her sister had got a new job which was very good news. On the fourth day Meselet had a hard test at school. On the fifth day she visited relatives. And on the sixth day she went to a wedding. Note particularly, the low coefficient of variation in cortisol both for morning and afternoon values.

Abdulfeta

Poor non street 12 year old male
Average cortisol: am - 0.263μg/dL
pm - 0.168μg/dL
Coefficient of variation: am - 40%
pm - 22%



Abdulfeta lives with his mother. His parents divorced when he was 10. His father remarried a year ago. Abdulfeta has one sister (13 years) and one brother (15 years), neither of whom work. Abdulfeta attends school in the afternoon, working for 3 hours each morning with his friends earning about 3 birr by providing change for taxi drivers by giving 95 cents of change for 1 birr. During the study he had breakfast at home each day, worked in the mornings and played with others at the drop in centre. He had lunch at home and then went to school, in the evening he played around his home and ate dinner there. On the first day he went to a wedding in the evening near his home, where he quarrelled with friends. Abdulfeta had an exam in the afternoon of the second and fourth days. On the evening of the third day he built a hut with his friends to watch football on the television in. He watched a sad film on the afternoon of the fourth day. On the fifth day he went on a trip organised by the drop in centre, he thoroughly enjoyed it and was very excited. On Sunday the final day, he was upset as his mother forbade him to go to a wedding in the afternoon.

These profiles show several occasions in which cortisol responses can be linked to specific reported events. Largely they involve increases in cortisol levels connected to an unusual or unpleasant occurrence, for example Yonas's high cortisol level on the day he begins work or Michael's high cortisol level shortly after receiving poor test results (for which his dad later beat him). Equally interesting however is the lack of cortisol response in some children to what I perceive to be quite important and varied events (see Meselet's profile and vignette). Naturally, it is the child's perception of the event which must be considered. Individual differences in temperament and behaviour, as well as personal history, are also thought to have considerable impact upon an individual child's cortisol response to specific experiences. My methodology did not include such qualitative measures of either dimension which are likely to be very difficult, yet interesting, to devise. Such limitations, along with the difficulties surrounding the interpretation of cortisol profiles using reported daily activity data, are discussed in detail in the following chapter.

Chapter 6 : Discussion

6.1. Evaluation of methods and suggestions for future research

It is important to discuss the problems and limitations faced in this research on two counts. Firstly I do this to put the results in context so as not to mislead the reader but instead to allow him/her to take part in judging the validity of the findings. The second reason is to suggest improvements for similar future research.

6.1.1. General problems

Research with street children is notoriously difficult, particularly where time is of the essence. The main limitation of this project was the time scale. Since the research was comparative my time was split between four sites, with only three weeks concentrated work at each site. This time was needed for actual measurements, consequently there was little time available for participant observation. Although the research is biological anthropology by name, the lack of detailed participant observation data creates a limitation to the interpretation of the quantitative data. A truly multidisciplinary study would place considerably more importance on psychosocial data relevant to these children.

I regard the anthropometric data collection process as a success. However, I now judge the saliva sample collection time schedule as lacking in sufficient rigor, this led to considerable frustration at the analyses stage where cortisol data required unnecessarily complicated analyses. As perhaps with most research, there remain many avenues that could have been investigated, most notably the impact of psychological/ temperamental factors. Overall however, this study has produced some interesting results to contribute to the investigation of physical and physiological differences between groups of children living markedly different lifestyles.

6.1.2. Categorising children

The problems associated with categorising poor urban children were discussed in detail in chapter one. It is important here to discuss the implications of this for the conclusions

reached. Note that it is specifically the child's lifestyle, rather than his/her family background, that is the focus of the present study. Precautions were taken to ensure that characteristics of the children's families, rather than their own current lifestyle, did not more adequately explain any differences. Possible classifications could combine street living and street working children into one group or combine the street working and poor non street children into one slum dwelling group.

In terms of anthropometry, recall that no differences were found between the street living and street working children. It could be argued that these groups should be combined into one group. However, I believe that retaining the distinction between the street living and working children, allows more detailed conclusions to be gained from the data. For example, whereas street working children show benefits in term of several anthropometric measures over poor non street children, street living children show only limited benefits. In contrast, cortisol data suggest that the three less privileged groups are each to be distinguished. While the cross sectional data show street working children have significantly higher mean cortisol than street living or poor non street children, the longitudinal cortisol results show no differences between the street working children and the poor non street children relative to the lower cortisol of street living children.

I appreciate that from a social research standpoint, it may be inappropriate to make such hard and fast distinctions between groups of children on paper, that are considerably blurred in real life. Nevertheless, considering the results from this project as a whole, I believe that for the purpose of this research, namely investigating differences in health profiles of children living markedly different lifestyles, the three poor urban categories used (street living, street working and poor non street) are acceptable and relevant.

6.1.3. Broadening the study

Fully analysing cortisol variation in real life contexts is remarkably difficult, especially in a culture different from one's own. In Ethiopia some detailed perceptual information was gained during focus group discussions. These data are difficult to present, and largely beyond the scope of this thesis. Nonetheless, detailed participant observation by the researcher both at the group and individual level could greatly increase

understanding of the children and their lives, not only of children's past life and their current daily activity, but also about their feelings and the meaning of events to them.

Mediating factors in the impact of lifestyle on physical and psychological health outcomes are much discussed. Social support, for example, is thought to provide a buffer against the health outcomes of a stressful event such as bereavement. Equally certain factors within the lives of the children studied could provide them with protective benefits against poor growth or cortisol reactivity. Mediating factors can be identified by dissociations in data, where certain variables are not significant for the whole population studied. For example a nuclear family or an extrovert temperament may act as a buffer to the psychological sequelae of street work for street working children. More detailed psychosocial data, notably measures of temperament, would have allowed more detailed analysis. Indeed across several studies (e.g. Long, Ungpahorn and Harrison (1993) in the UK, Lundberg, Rasch and Westermark (1991) in Sweden, Spangler (1995) in Germany and Gunnar, Tout, de Haan, Pierce and Stansbury (1997) in the US) a range of findings are reported. In some situations school appears to be viewed as a positive stressor, in others it is not. This is influenced largely by temperamental factors and whether children have the social competency skills to cope the interactions school brings. The impact that individual differences have upon cortisol clearly indicates the difficulties of making superficial comparisons between broad contextual situations. The profiles discussed later with relation to daily activity go some way to achieving more detailed and individual analysis in this study. However in Ethiopia temperamental or psychological assessments of the children are not included, partly because of the remarkable difficulty of doing so in a cross cultural context. Such investigation in Ethiopia would have been relevant to the work of Worthman (1996) in the analysis of how social context and temperamental variation interacts with biological systems in determining individual development pathways and human adaptation.

Conducting morbidity studies with street children would prove difficult since reported morbidity is unreliable (as discussed previously). Wright and his colleagues (1993) studied morbidity in Tegucigalpa (Honduras) using medical reports by case workers. They found that although homeless children suffered exceptional levels of physical and mental anguish, malnutrition was higher among working than homeless children. It was noted that "because of the substandard housing conditions that prevail throughout

Tegucigalpa, the distinction between people with homes and the homeless is not always obvious" (*ibid.*:297). The same is true of Ethiopia, where most poor urban homes consisted of five sheets of metal, a few stones and a hinged door, enclosing a space of perhaps 2 by 3 meters. Nonetheless accurate morbidity data would help provide a full picture of the health and well-being of urban children in Ethiopia.

Lastly this study does not respond to the growing realization within anthropological research that children are generally subjected to a "top down" approach on the part of adult researchers (Panter-Brick, 1998). Without more lengthy participant observation, I accept the concern that "the reality of becoming homeless is likely to be even more complex than a structured questionnaire or interview can reveal, with a variable mix of economic, family and personal reasons operating in each case" (Panter-Brick *et al.*, 1997:138). This research is primarily for an academic audience and investigates aspects of the children's well-being that are far removed from the reality of the children's daily lives. Only to a limited extent did the open attitude employed during the research, and the methods of contextual data collection, attempt to allow the children to convey what they, as individuals, considered important in their daily lives.

6.1.4. More intense study for cortisol

"The use of daily cortisol profiles in combination with point assessment of adrenocortical responses, subjective mood ratings, and external health status assessment could yield valuable information on the time course of chronic stress effects" (Kirschobaum and Hellhammer, 1994:329). Such research is ambitious, yet shown to be possible by Flinn and his colleagues in the Caribbean. Such data yields particularly interesting and detailed results.

6.1.5. Longitudinal study for growth

Identifying any specific "difficult" periods for the children during the transition to street life is important in terms of health promotion, it would indicate vulnerable periods for the child when intervention may be most effective. Additionally a more detailed ethnographic study of the children's lifestyles would be productive in gaining an increased understanding of factors within the lifestyle that may cause growth differences.

This would necessitate a longitudinal study however with no significant differences found between the three less privileged groups in this study in terms of stunting it may be appropriate to assume that their backgrounds are similar and that growth deficits occurred in all three groups in accordance with similar childhood processes. A longitudinal study could identify potential changes in growth status concurrent with the often gradual move further into street life, so investigating further whether street working children have advantages because they get the best of both worlds; work and family support. Whereas street living children lose such benefits despite good earning because of their precarious situation. Of course tracking street children over several years for a longitudinal study would present considerable practical difficulties.

6.2. GROWTH

6.2.1. Middle class as a comparison group

As expected middle class children show higher fat levels and are taller and heavier for their age than each of the three deprived groups. They have relatively lower weight-for-height z-scores because of their greater height. The middle class children provide a well nourished and cared for control group, showing optimal growth within a genetically appropriate comparison group for other Ethiopian children. While the three deprived groups of Ethiopian children have significant growth retardation in comparison to a U.S. reference population, the middle class children are within the adequate range for growth status. This suggests that differences in z-scores for deprived groups of children in Ethiopia compared to the U.S. reference population cannot be explained solely by genetic variation, but instead they reflect immediate environmental/socioeconomic factors. The function of measuring a group of middle class children was to allow genetic factors for growth profiles to be discounted; this done the focus shall move to comparing differences between the three less privileged lifestyle groups.

6.2.2. Comparing the three less privileged lifestyle groups

On no anthropometric measure were street living or street working children in Ethiopia found to be worse off than poor non street children; indeed on several measures they had better growth status. Body fat, as measured by sum of skinfold and mid upper arm

circumference, was greater for street children than poor non street children. Such measures reflect current nutritional status. Since fat stores are vital as protection against times of shortages in food availability, the results suggest that street children are physically more prepared for, and able to cope with, periods of additional hardship in their lives than poor non street children. A second measure which reflects current nutritional status is weight-for-height z-score which indicates wasting. Street working children were found to be significantly less thin than poor non street children. Such results regarding current nutrition may be because street children (both street living and street working) earn for themselves they are more able to spend their money to satisfy their own needs. They may be able to treat themselves to high energy foods such as cakes and sweets; luxuries, I suggest, poor non street children with no dispensable income of their own and living in poor households are likely to enjoy less often. Following this argument one might expect a difference in fat levels between street living and working children, as the former have full control over their income whilst the latter report giving the majority of their earnings to their parents. Results show no significant difference in fat levels between street living and working children. This may be due to street working children having considerable freedom to spend money during their working time on "treats" for themselves whilst unsupervised by adults. Alternatively it may be that fat levels are more associated with the actual amount of money spent on food; this is possibly higher for both street living children alone and the families of street working children, than for the families of poor non street children.

Additionally street living and working children generally have greater access to NGO "soup kitchens" and reported having other means of gaining food in kind notably more often than poor non street children. The donors were often restaurateurs but also adults who had befriended the child in some way. Achieving this form of support demonstrates a child's social competencies and survival skills. It also highlights that reported income is a very limited measure of success on the street. It is worth noting that income and gifts in kind may have been under-reported by the children in the hope that a portrayed worse plight may have some benefit. This may be in terms of anticipated aid, despite explicitly informing all children that the research was in no way related to aid giving organisations. The two-thirds of children who reported earning less than two birr per day would find it hard to provide for themselves on their earnings alone. It is therefore

not surprising that such a high proportion of children receive goods in kind; indeed it would be difficult to survive without.

Ethiopian children were asked about their main problems, it is interesting that only 9% of street living and 10% of poor non street children mentioned hunger or food as their main problem, yet 30% of street working children did so. This is despite street working children reporting similar earnings (2 birr) to street living children (2.3 birr), for which a cheap meal and some snacks can be bought. The main dish in Ethiopia is *injera* (a very large pancake like base) which is served with a variety of *wot* (spicy sauces made of vegetables, lentils or meat). Fasting plays a prominent part in Christian Orthodoxy in Ethiopia, on each Wednesday and Friday, as well as numerous individual religious days and some longer periods of religious fasting, meat should not be consumed. Therefore, although many cannot afford to eat meat, many others actively chose not to eat meat. It is possible to get a cheap filling meal of *injera* with fasting *wot* for 1 to 1.5 birr (approximately 10-15p).

An alternative explanation for poor non street children showing poorer growth status than street children could be based on high disease load, resulting in impaired growth as energy is diverted to fight illness. It would be surprising however if poor non street working children were exposed to more disease than street children; indeed the reverse is expected. However, unexpectedly from the structured interview data street living children did report least current and past illness followed by street working children and lastly poor non street children. Although this may explain differences in growth status, as previously discussed, reported illness data may in fact reflect willingness to report illness and/or let it interrupt normal activity, rather than actual differences in disease load experienced. In Nepal two methods of assessing illness gave diametrically opposite results. Perceived health status from self reported data showed village children to report least disease (Baker *et al.*, 1996), however by assessing the blood protein alpha-1-antichymotripsin (which reflects inflammation in response to pathogen exposure) village children clearly suffered the most infections. This illustrates both the importance of triangulating results, and that the usefulness of self-reports is, in many circumstances, limited to perceived experience (Panter-Brick, 1998a). In Ethiopia blood spots were not taken; this is an invasive procedure even if minimally invasive. When the idea of blood spot method was raised in Ethiopia, it was forcefully rejected by university officials, and

staff at the schools and NGOs where the research was conducted. They appeared suspicious of the methodology and were insistent that only a medical doctor should take blood spots.

Past nutritional and disease status is reflected in height-for-age z-scores. Stunting occurs during the first two years of life and is therefore a reflection of past malnutrition and/or disease. No significant differences were found between the means of the three disadvantaged groups, who were all on average mildly stunted. The lack of significant differences between the three disadvantaged groups suggests that the children from all three disadvantaged groups are from similarly deprived families. If this is the case, it follows that the factors which push or pull the children onto the street are not necessarily based on poverty levels alone since these may be equal between street living, working and poor non street children. Instead such factors are likely to reflect specific features of the family's composition or relationships, and/or specific temperamental or behavioural characteristics of the child. This is corroborated by the Ethiopian children's reported reasons for joining the street.

The final anthropometric variable (weight-for-age z-score) provides a composite measure of being underweight so indicating past and/or current malnutrition and/or disease load. Street working children were significantly less underweight than poor non street children. The drawback with this measure is that it is impossible to determine whether the children are underweight because they are tall and too thin, or short and of adequate weight for height. Nevertheless this measure does add weight to the consistent evidence from this study that street children do not have poorer growth status than their poor urban counterparts.

The length of time since joining the street does not correlate with any anthropometric measure (although the sample size was relatively small and the data reported). Nevertheless, this provides additional support that streetism *per se* may not be negative to health. Similar data are not available for street working children.

Overall the growth data combined go some way to contradicting assumptions that street children are the most needy and the least healthy children within the Ethiopian urban environment. Where differences do lie they show street working children have

consistently better health profiles than poor non street children and street living children have somewhat better health profiles than poor non street children. It is possible that for street working children joining the street at this limited level with the family remaining the foundation of life brings benefits. Such benefits may be lost, as compared to poor non street children, once the child moves further into streetism and actually begins to live on the street.

6.2.3. Comparisons with other studies

This Ethiopian study lends support to findings from Nepal (Panter-Brick *et al.*, 1996) and Indonesia (Gross *et al.*, 1996) which, like current social research, argue that on many different measures, including growth, street children are not at the bottom of the pile of urban children in terms of well-being. Data from the three studies are summarised in the three tables below. The Nepali study (Katmandu) (Panter-Brick *et al.*, 1996) only involved boys so is compared with male only data from Ethiopia although girls in Nepal show the same relative profile between groups of children (pers. comm.). A summary of findings from a second study in Indonesia (Jakarta) (Gross *et al.*, 1996) are given, however the actual results are not in a format directly comparable with the Ethiopia and Nepal data. The data show Ethiopian boys to be thinner but less stunted and underweight than Nepalese boys.

Table 6.1. Stunting (height-for-age z-scores)

Study	Street living children	Street working children	Poor non street children	Middle class children
Ethiopia	-1.76 (±0.85) n=78	-1.42 (±0.84) n=90	-1.59 (±0.89) n=69	-0.56 (±0.83) n=75
Ethiopia (boys)	-1.70 (±0.83) n=68	-1.50 (±0.88) n=45	-1.81 (±0.94) n=26	-0.53 (±0.84) n=40
Nepal	-2.39 (±0.79) n=111	-2.68 (±0.77) n=62		-1.89 (±0.86) n=82
Jakarta	Street children taller than their socio-economic, slum dwelling peers			

Table 6.2. Wasting (weight-for-height z-scores)

Study	Street living children	Street working children	Poor non street children	Middle class children
Ethiopia	-0.72 (±0.61) n=78	-0.62 (±0.66) n=90	-0.84 (±0.72) n=69	-0.62 (±0.92) n=75
Ethiopia (boys)	-0.79 (±0.61) n=68	-0.76 (±0.62) n=45	-0.91 (±0.72) n=27	-0.62 (±0.88) n=37
Nepal	-0.22 (±0.62) n=111	-0.27 (±0.70) n=62		-0.17 (±0.82) n=82
Jakarta	Street children show less wasting than their socio-economic, slum dwelling peers			

Table 6.3. Underweight (weight-for-age z-scores)

Study	Street living children	Street working children	Poor non street children	Middle class children
Ethiopia	-1.72 (±0.65) n=78	-1.42 (±0.62) n=90	-1.66 (±0.63) n=69	-0.82 (±0.82) n=72
Ethiopia (boys)	-1.76 (±0.68) n=68	-1.61 (±0.60) n=45	-1.89 (±0.62) n=27	-0.76 (±0.87) n=40
Nepal	-1.90 (±0.61) n=111	-2.03 (±0.49) n=62		-1.46 (±0.61) n=82
Jakarta	no results given			

6.3. CORTISOL

6.3.1. Cortisol levels

The cross sectional phase found poor non street children to have significantly higher mean cortisol levels than each of the other three groups. The longitudinal phase found both poor non street and street working children to have significantly higher mean cortisol than both street living and middle class children. It could be argued that the longitudinal phase is more accurate since six morning and six afternoon repeat measures are combined. However the cross sectional phase includes a larger number of children despite the single sample likely to be more susceptible to influences of the research being novel to the children. The fact that the two phases do not contradict each other greatly goes some way to supporting the validity of the findings.

Several explanations could be proposed for the results obtained. I do not focus on the middle class children, assuming that their low cortisol level is a product of their relatively stress free existence. It is the relationships between the other three groups that are discussed here. One explanation for street living children to have lower cortisol than

the two other less privileged groups may be that unlike street living children, poor non street children and street working children both have to deal with the pressure of living within poor families, at least some of which may contain difficult relationships which are likely to cause psychosocial stress. Another argument may be that since street living children can control their own lives, without immediate pressures of family relationships, they experience less stress, which is reflected in low cortisol levels.

Alternatively it may be that the street living children's past lives have been more stressful, hence them joining the street, and consequently they have developed blunted cortisol profiles through a process of adaptation. From my own observations of the harsh lives of street living children, I would be more willing to accept this latter suggestion. Particularly as in this study cortisol does not correlate with children's reported perceived family or friend support. Nor does it correlate with happiness with life in general or with how the child felt about the current day (through ratings of how good the day was or how worried the child felt). Blunting is thought to be the result of exposure to chronic stressors causing habituation in both physiological and psychosocial terms so dampening reactions and avoiding the negative consequences of chronically high cortisol. However, a blunted profile may also be harmful in not allowing optimal physiological responses to stressful situations. An environment of chronic stress or specific stressful events may permanently alter the HPA axis which is associated with emotional regulation, temperamental and behavioural outcomes, as well as general health. For example Hart, Gunnar and Cicchetti (1995) worked at a U.S. pre school with maltreated children who showed low reactivity, possibly due to a blunting of cortisol responses. Hart *et al.* (1995) refer to maltreatment as an adaptational challenge against which the HPA axis may be altered to control physiological responses in order to maintain effective cognition, emotion, behaviour and metabolic activity despite chronic threat.

Cortisol variation is a complex and interrelated phenomenon, hence these results are not easily explained. Nonetheless the results do provide considerable food for thought, both alone and in comparison with other studies.

6.3.2. Cortisol data compared with other studies

In Nepal mean cortisol values for morning samples from children aged 10-14 were significantly higher for homeless boys and middle class school boys relative to slum dwellers ($p<0.001$). In Ethiopia the opposite relationship is found with poor non street and street working children showing higher cortisol relative to street living children and middle class children. Such differences could be because the environment and/or general daily activity of street children in the two countries differs in some aspect. Please note, I discuss here the longitudinal data from Ethiopia only, as these are directly comparable with the Nepal data. There are some variations in the methodology used, for example, all the children in the study in Ethiopia were asked to meet the researchers twice each day to give saliva samples whereas in Nepal the children came to several locations including street corners, NGO centres and outside a temple (Panter-Brick, pers. comm.). Nonetheless, neither method was deemed to disrupt most children's routines as the research/meeting sites were chosen to be places that the children were likely to be easily available. The total number of samples in the Nepal data is greater than from Ethiopia which may imply greater accuracy of the Nepal data. The data from Ethiopia demonstrated significant differences between groups suggesting the sample size was adequate. The time of sampling since waking in the Ethiopian study is approximately 30 minutes earlier than in Nepal. All the same, the Ethiopian data are corrected for time of sample, therefore any differences in sampling time will not affect the results in terms of the relationships between different groups of children. It will, of course, affect any direct comparison of cortisol levels. Nonetheless, I believe it is unlikely that the directly opposing results produced in Ethiopia and Nepal are symptomatic of methodological differences, which indicates that mean cortisol levels do not follow similar patterns between similar lifestyle groups across cultures.

Flinn and England (1997) studied the relationship between childhood stress and family environment by comparing cortisol profiles with family composition. They found that children living with step fathers, distant relatives, or single mothers without kin, have higher cortisol values than those living with both parents, single parents with kin or grandparents. This suggests that current and/or past family environment is significant in helping to determine children's cortisol levels. Cortisol did not vary dependent upon who the child currently lives with in these data from Ethiopia, this may be a factor of the

less intensive cortisol sampling in Ethiopia than the Caribbean or it may be an indication that cortisol patterns are not consistent between children from different cultures or living in different environments.

In this study cortisol data, neither cortisol level nor cortisol variation, was associated with any anthropometric data. Fernald and McGregor (1998) studied cortisol reactivity in relation to growth status in children aged 8-10 in Kingston (Jamaica). They found an interaction between the measures (and inhibition) when children were experimentally exposed to induced physical and psychological stress. The Ethiopian study does not investigate cortisol reactivity (from experimentally induced stress) but rather cortisol variation (as a result of real life naturalistic events). This may explain why the Jamaican results were not replicated in the Ethiopian data. Additionally the children in Ethiopia suffer from mild stunting rather than moderate or severe stunting as seen in the children studied in Jamaica, it may be that the HPA is not affected until stunting is more severe. However in a pilot study in Nepal the association between stunting and cortisol was also not seen (Fernald, in prep). Nonetheless, both the Jamaican data and the Ethiopian data support the hypothesis that the HPA axis may be altered during development depending upon childhood experience, growth failure in one case and chronic psychosocial stress in the other.

The Ethiopian data further demonstrate the complexity of cortisol variation. However, where absolute data is available the studies discussed all find remarkably similar overall mean cortisol levels for a comparable time of sampling (table 6.4). Published cortisol values for Western children range from 0.23 to 0.66 μg/dL (Panter-Brick, 1998a). Therefore, despite these studies finding different patterns of cortisol levels between groups of children, the overall mean cortisol data are sufficiently similar to suggest that there are also considerable similarities in children's cortisol between cultures.

Table 6.4. Longitudinal mean and standard deviation of cortisol for morning samples only

Study	Street living children	Street working children	Poor non street children	Middle class children
		Slum dwellers (Nepal)		
Ethiopia				
cortisol (µg/dL)	0.39±0.12	0.42±0.15	0.47±0.11	0.33±0.12
time*	0:52	1:48	1:38	1:19
n**	19x5.9=112	14x5.8=81	9x5.9=53	16x5.4=86
Ethiopia (boys)				
cortisol (µg/dL)	0.36±0.12	0.44±0.13	0.48±0.12	0.35±0.14
time*	0:56	1:43	1:47	1:30
n**	13x6=96	7x6=42	3x6=18	8x5.1=41
Nepal				
cortisol (µg/dL)	0.27 ± 0.08	0.18 ± 0.06		0.24 ± 0.08
time*	1:27	2:21		2:25
n**	27x9=243	20x9=180		30x6=180
Caribbean				
cortisol (µg/dL)		0.58	0.22	
time*		0:10	2:00	
n***		>100	>100	

* time given as time since waking

** number of children by average number of samples per child
(i.e. 19 children gave a total of 112 samples, making an overage of 5.9 samples per child)

*** Flinn *et al.* standardised their data using 5 minute time intervals mad possible be the vast number of samples collected, more than 100 samples were available for each 5 minute time interval

6.3.3. Cortisol variation

The coefficient of variation is a measure of "day to day cortisol variability [which] reflects reactivity to ongoing experience and/or level of predictability of daily events" (Panter-Brick, Worthman, Lunn, Baker and Todd, 1996:10). Street working children show lower afternoon coefficient of variation in cortisol compared to each of the other three lifestyle groups, however no differences are found in morning coefficient of variation in cortisol. Since street working children already show high cortisol, this may partly explain their low coefficient of variation. Naturally a low coefficient of variation is likely to reflect a lack of stress exposure. However, since it could be argued that street working children have the most variety in their lives, as they must deal with life on the street and life in the home, this result is somewhat unexpected. An alternative explanation may be that the support they receive at home buffers them from the stress of street life. Alternatively their cortisol variation may be blunted by chronic stress, however I would be reluctant to argue this since I argue such a theory to explain the low cortisol level of street living children relative to street working and poor non street children.

6.3.4. Cortisol profiles

The cortisol profiles presented in chapter five provide detailed data of cortisol variability within a child with reference to daily activity. It is tremendously difficult to draw any firm conclusions from these profiles, nonetheless I discuss here a number of observations.

- Tsegaye showed higher afternoon cortisol on the day he did not spent the morning at school, but instead played and worked on the streets with friends.
- Yemariamwok showed remarkably constant afternoon cortisol despite a high coefficient of variation in cortisol for the morning. Yemariamwok showed a particularly high cortisol on Saturday morning and somewhat higher on Sunday morning which may be related to the less structured day ahead than on school mornings. However the cortisol value on other school mornings was not constant for Yemariamwok.
- Yonas showed particularly high afternoon cortisol on the day he first began work in a restaurant.
- Helson showed particularly high afternoon cortisol on the day she received money from her aunt in Canada.
- Michael showed low morning and high afternoon cortisol on the day he received a poor test result and was subsequently beaten by his father. The following day, a Saturday, Michael spent playing with friends and both his morning and afternoon cortisol values were very high relative to school days.
- Abeba showed high morning and afternoon cortisol on the day she played with friends at her uncle's house.
- Abdulfeta showed low morning cortisol on the day he did not attend school, his afternoon values did not alter despite, for example, a trip on the fifth day.

Mostly I have identified above, particularly unusual cortisol levels associated with certain activities reported by the children. There are also an equal number of events reported by the children which are not reflected in cortisol variation. For example, Meselet shows remarkably constant cortisol levels and therefore low coefficient of variation for cortisol yet reports seemingly (admittedly in my perception) quite a variety of events during the study period.

These cortisol profiles indicate the complexity of cortisol and its variation. Examples were seen both of particular peaks and troughs being, and not being, linked directly to an obvious event in the day as reported by the child. This suggests firstly, that cortisol is

not always affected by reported events or activity in the child's day, nor by reported feeling about the day (i.e. how good the day was and how worried the child felt). Secondly, that cortisol can be influenced by minor events or feelings which were not reported by the child, these may be unconscious to the child or deemed to be important (and therefore not reported) by the child. Again it is important to assess the adequacy of the methodology before accepting such findings. It is also probable that this study was inadequately intense to identify the full impact (or lack thereof) for all events reported. However the research assistants spent considerable time asking in several different ways in Amharic if the child was bothered much by things that day, and whether they were worried or frightened by anything, this aimed to give an indication of stress. The cortisol profile associations discussed above strongly suggest that cortisol in Ethiopian children is affected by daily activity, but that the strength of this link varies between individual children.

Flinn (1999) identifies two distinct cortisol profiles; firstly a low base level with large spikes; and secondly a chronically high cortisol level. The first profile has high behavioural costs as the children show low sociability and high aggressiveness, this profile is more commonly displayed by boys. Such a profile can be seen to some extent is several of the profiles presented in the previous chapter, most notably by Yemariamwok, Yonas and Helson. The second profile has high physiological and social costs as the children tend to be shy and socially anxious; girls more often show this profile. This profile pattern is shown by Meselet, although the actual value of her cortisol level is not particularly high compared to the other children there is little difference between her morning and afternoon cortisol level. Flinn (1999:130) concludes "that naturally occurring psychosocial events associated with stress hormones have significantly short- and long- term effects on child health. This finding is consistent with a large body of clinical and retrospective studies that indicate "stress" has negative effects on health".

6.4. CONCLUSIONS

This research attempts to address the challenge of studying the inter-relatedness of various dimensions of well-being in urban children. It is a particular challenge to complete such work with street children who form an understudied population which presents unique methodological difficulties (Panter-Brick, 1998). It is important to develop such research into fully multidisciplinary studies of street life, so incorporating vital psychosocial and temperamental measures (soft data), along with further physiological assessments (hard data). More subtle information could then shine better light on the differences identified in this study and thereby further challenge expectations surrounding street children.

Traditional (lay and media led) assumptions concerning the well-being and welfare of street children are being questioned from different directions, these Ethiopian data add to the growing body of evidence suggesting that children can cope adequately with street life. These results reflect the shift over recent years to a focus on strength and resilience in street children, as opposed to weakness and vulnerability. That is not to promote or glorify street life, but rather to accept streetism as a rational response to poverty and/or poor kin relations, as proposed by Veale *et al.*'s (in press) rational choice model. Such results are supported from a socio-economic perspective, particularly in cultures where children are encouraged and proud to be economically active at an early age. For example, Bar-On (1997) argues against the stereotypic image of street children as desperate and helpless, pointing out that "on average, street children earn one to one and a half times the minimum wage of adults" (Blanc, 1994; Prioio, Moselina and Swift, 1994, all cited in Bar-On, 1997:69). As the children can spend some or all of this money on themselves, they are likely to be able to meet their nutritional needs more regularly than many children's own families could. This is demonstrated in the weight-for-age and weight-for-height z-score results from the Ethiopian study.

It is possible that full economic independence of street living children is preferable to the consequences of failing to meet the financial contribution demands of family members in the home as a street working child. Nonetheless with reference to street living children Hecht (1998:195) writes that in Brazil "street life is an alternative to home life, but it is a violently unappealing one for most children precisely because it is a confirmation of their

failure to nurture the household". From the Ethiopian study street working children show consistently better growth status than poor non street children whilst street living children show some growth advantages over poor non street children. Interestingly, results from this study in Ethiopia in terms of stunting suggest that the family background, and in particular the nutritional support received during childhood is similar for street living, street working and poor non street children.

The present data support the emerging view from a broad range of studies in a wide variety of locations, that in terms of health and well-being there may be circumstances equally bad, or even worse, than growing up on the street. Street life is seen in this study to have certain advantages over the lives of poor non street children, however we must remain mindful of the costs of street life not discussed here, for example those of violence, substance abuse and hostility from society at large. Other costs include the yet unresearched but potential long term costs of streetism which are most likely to include psychosocial well-being for example self esteem. Nonetheless, in terms of current anthropometric well-being in street children, it appears that street working children benefit from having the best of both worlds; the street and the home and family. Whilst street living children lose some of these benefits so only showing limited advantageous growth status compared to poor non street children. Importantly, these results are somewhat contradicted by clear evidence of greater reported unhappiness in street children than poor non street children.

In terms of cortisol these results suggest that cortisol levels vary between lifestyle groups. The "cortisol data [also] reveal both blunted and hyper-variable individual profiles in response to significant stressors of the street environment" (Panter-Brick, Dobrowolska and Drewett, 1999:218). Cortisol is affected by a whole host of past and present psychological, behavioural and contextual variables. The direction of causality between behaviour, temperament and cortisol is hard to identify; with a web of physiological and psychosocial influences present. The results and profiles presented in this research add further evidence to the complexity of cortisol variation.

This study considers cortisol data as a measure of well-being for Ethiopian urban children, yet without a clear understanding of the role of cortisol, findings are hard to interpret. Increasing attention is being paid to the potential role of hormones in

mediating between environment and lifestyle, and between health, well-being and behaviour. This work is exciting but needs more investigation which is becoming increasingly feasible with improvements in non-invasive methodological procedures now available. Understanding how different markers of physical and physiological health, socio-economic circumstances, and psychological status triangulate to offer a comprehensive picture of "health and well-being" is important. However, as discussed previously, caution must be taken against being over-optimistic, at this stage, of the value of this data considering the current problems in interpreting cortisol data. Despite these difficulties, the potential in increasing our understanding of how poor environments may adversely affect health and well-being is significant.

Appendices

A1.1. Research expenses

EXPENSE		ETHIOPIAN BIRR	POUNDS STERLING
Expenses in U. K. in preparation for fieldwork			
Flight from London Heathrow to Addis Ababa			492.00
penalty fee for change of return date			62.50
Transport from Durham to Heathrow			73.00
Insurance			129.00
extension fee			97.80
Immunizations (yellow fever)			25.00
Visa from UK			43.00
Equipment:	Blood pressure monitor		62.95
	Child blood pressure cuff		23.50
	Vials (1000)		64.95
	Lancets		15.99
Subtotal			**1089.69**
Expenses in Ethiopia for fieldwork			
NB: Conversion from Ethiopian Birr to Pounds Sterling made at the rate of 11 birr = £1.00			
Residence permit		1235	112.30
University affiliation fee		1250	113.60
Data photocopying	1520 sheets at 0.40 birr per sheet	608	55.30
Research assistants	Pilot study & First phase - 1½ mths		
	measurer - 500 birr/mth	750	68.20
	translator - 1500 birr/mth	2250	204.60
	street facilitator	400	36.40
	Second phase - 2 mths		
	translator - 1500 birr/mth	3000	272.70
	street facilitator	400	36.40

EXPENSE		ETHIOPIAN BIRR	POUNDS STERLING
Participant rewards	Pilot study - 32 children (4 birr per child)	128	11.60
	First phase - 320 children (4 birr per child)	1280	116.40
	Second phase - 62 children (10 birr per child)	620	56.40
Accommodation	2 mths at University Guest House 50 birr per night (62 days)	3050	272.70
	remainder of stay in rented house 25 birr per night (129 days)	3225	293.20
Subsistence	daily allowance 20 birr for 191 days	3820	347.30
Subtotal			**1997.10**
Laboratory costs			
Cortisol assay kits:	2 x 500 tubes		700.00
	2 x 100 tubes		208.00
	post and package		54.50
Laboratory work expenses			116.50
Subtotal			**1079.00**
TOTAL			**4165.79**

GRANTS RECEIVED

University of Durham	To Dr Catherine Panter-Brick	**2000.00**
Boise Fund		**700.00**
Parkes Foundation	To Hannah Dobrowolska	**600.00**
Anthropology Department, University of Durham		**280.00**
TOTAL		**3580.00**

A1.2. Structured interview protocol

Questionnaire

Interview Information

A1 ID number *(ensure child's name is in the code book)*

A2 Location of interview

GTS - Goal
MU - Mobile Unit
MS - Menelik School
MC - Magic Carpet School

A3 Date *(please use Gregorian Calendar)*

A4 Time *(please use Western style)*

Basic Information

B1 Sex

M - male
F - female

B2 How old are you? *(If age is an estimate, please write* EST.*)*
What month is your birthday in? *(Use Western 12 month calendar)*

B3 Which ethnic group does your father belong to?
Which ethnic group does your mother belong to?

A - Amhara
O - Oromo
G - Gurage
T - Tigrian
DK - don't know
OTH - other (please specify)

B4 Where were you born? *(i.e. where did child spend infancy?)*

i) town _____ **[IF IN ADDIS ABABA GO TO QUEST C2]**
ii) administrative region _____

Was this a rural or urban area?

iii) U - urban
SU - semi-urban
R - rural
DK - don't know

B5 **[IF NOT BORN IN ADDIS ABABA]**
When did you move to Addis Ababa?
(please give response in number of years and/or months ago, please write EST *if it is an estimate)*

Family and home circumstances

C2 Who do you live with at the moment?
Please list the people that you live with and their relationship to you.

M - mother
F - father
GM - grandmother
GF - grandfather
FR - friends
O - other *(please specify)*
S - sister
B - brother
SS - step sister
SB - step brother
ST - strangers
A - aunt
U - uncle
FC - female cousin
MC - male cousin
NO - no one

[IF WITH PARENTS GO TO QUEST C6]

C3 **[IF DOES NOT LIVE WITH PARENTS]**
Where do your mother and father live now?
i) town _____
ii) administrative region _____

Is that place urban or rural?
iii) U - urban
SU - semi-urban
R - rural
DK - don't know

C4 **[IF DOES NOT LIVE WITH PARENTS]**
When did you stop living with your parents?
(please give response in number of years and/or months ago, please write EST *if it is an estimate)*

C5 **[IF DOES NOT LIVE WITH PARENTS]**
Why do you not live with your parents? *(child's own words)*

C6 Please can you tell me what type of shelter or home you live in now?
BR - brick/stone
M - mud/sticks/bamboo
V - verandah
T - tin
P - plastic
O - other *(please specify)*
[IF LIVES WITH PARENTS GO TO QUEST C8]

C7 **[IF DOES NOT LIVE WITH PARENTS]**
Please can you tell me what type of shelter or home your family lived in when you last saw them?
BR - brick/stone
M - mud/sticks/bamboo
DK - don't know
T - tin
P - plastic
O - other *(please specify)*

C8 Please tell me about your family.
If necessary prompt child with the following questions:

- Is your mother still alive? If not when did she die?
- Is your father still alive? If not when did he die?

- [IF BOTH PARENTS ALIVE] Do your parents live together?
  T - together
  SC - separated due to circumstances
  D - divorced
  [IF NOT STILL TOGETHER] When did they separate?
- [IF NOT STILL TOGETHER] Does your mother/father have a new partner? When did this happen?

- Do you have any brothers or sisters?
  [IF HAS BROTHERS/SISTERS] How many do you have?
  Could you tell me their ages?
- Do you have any step brothers or sisters?
  [IF HAS STEP BROTHERS/SISTERS] How many do you have?
  Could you tell me their ages?

- [IF HAS (STEP) BROTHERS/SISTERS]
  I would like to know about your (step) brothers and sisters.
  1) Please tell me if they attend school.
     ✓ - attends school
     × - doesn't attend school
     N - has never attended school

DK - don't know

2) Do they spend any time on the streets? If yes, what do they do there?
   - × - doesn't spend time on the streets
   - W - works
   - B - begs
   - P - plays
   - DK - don't know
   - O - other *(please state)*

3) Where do they sleep?
   - H - home
   - HS - sometimes in the home and sometimes on the street
   - S - street
   - NGO - NGO shelter
   - DK - don't know
   - O - other *(please state)*

4) Where do they live?
   - AA - Addis Ababa
   - O - other *(please state)*
     - U - urban
     - SU - semi-urban
     - R - rural
     - DK - don't know
   - DK - don't know

C9 How does your father earn a living?

- L - laborer/informal
- SK - skilled/self employed
- GE - government employee
- SV - street vendor
- DK - don't know
- N - nothing
- F - farmer
- T - trader
- PE - private employee
- B - beggar
- R - retired
- O - other *(please specify)*

C10 Was your father a soldier?

- ✓ - yes
- × - no

C11 Has your father ever had any formal education?

If yes - Up to which grade? Grade _____

If no - Can he read and write?

- RW - read and write
- R - read only
- I - illiterate

DK - don't know

C12 How does your mother earn a living?

- L - laborer/informal
- SK - skilled/self employed
- GE - government employee
- SV - street vendor
- DK - don't know
- N - nothing
- HS - house servant
- HW - house wife
- PE - private employee
- B - beggar
- R - retired
- O - other *(please specify)*

C13 Has your mother ever had any formal education?

If yes - Up to which grade? Grade _____

If no - Can he read and write?

RW - read and write
R - read only
I - illiterate
DK - don't know

About the child

D1 Do you attend school now?
✓ - yes × - no **[IF NO GO TO QUEST D5]**

D2 **[IF DOES GO TO SCHOOL NOW]**
What grade are you in? Grade _____

D3 **[IF DOES GO TO SCHOOL NOW]**
What type of school do you attend?
PR - private CH - church
P - public G - government

D4 **[IF DOES GO TO SCHOOL NOW]**
Who pays for your schooling, both for fees and/or materials such as pens and exercise books?
P - parents R - other relatives
S - self NGO - NGO
[GO TO QUEST E1]

D5 **[IF DOES NOT GO TO SCHOOL NOW]**
Have you ever been to school?
✓ - yes *(up to which grade)* × - no **[IF NO GO TO QUEST D8]**

D6 **[IF DOES NOT CURRENTLY ATTEND SCHOOL BUT HAS ATTENDED IN THE PAST]**
When did you leave school? *(child's own words)*

D7 **[IF DOES NOT CURRENTLY ATTEND SCHOOL BUT HAS ATTENDED IN THE PAST]**
Why did you leave school? *(child's own words)*

D8 **[IF DOES NOT GO TO SCHOOL NOW]**
Do you think that you will attend school sometime in the future?
✓ - yes × - no

Religion

E1 What religion are you?
OC - Orthodox Christian M - Muslim
P - Protestant CC - Catholic
DK - don't know N - nothing
O - other *(please specify)*

E2 Do you attend religious services?
✓ - yes *(if yes, how often?)* × - no

E3 Do you cross yourself when you see a church?
✓ - yes *(if yes, how often?)* × - no

E4 Do you ever pray alone?
✓ - yes *(if yes, how often?)* × - no

Street life

F1 Do you spend much time on the streets? *(i.e. on average 3 hours or more per day)*
✓ - yes × - no **[GO TO QUEST F7]**

F2 **[IF SPEND TIME ON THE STREET]**
What do you do on the streets?
W - work P - play
B - both work and play O - other *(please specify)*

F3 **[IF WORK ON THE STREET]**
What is your main work on the streets? *(child's own words)*

F4 **[IF WORK ON THE STREET]**
Do you do any other types of work apart from this? *(child's own words)*

F5 **[IF SPEND TIME ON THE STREET]**
Who are you with when you are on the street?
P - parents FR - friends
S - siblings R - other relatives
A - alone O - other *(please specify)*

F6 [IF SPEND TIME ON THE STREET]
Have you ever been hurt whilst you have been on the street now or in the past?
✓ - yes × - no **[GO TO QUEST F7]**
If yes: How have you been hurt?
E - emotionally
P - physically
S - sexually
How often does this happen, both now and in the past?
Who is it that hurts you, both now and in the past?

F7 Do you earn any money in any way at all, other than working on the street?
✓ - yes × - no **[IF THEREFORE DO NOT WORK AT ALL, GO TO QUEST G1]**

F8 **[IF WORK]**
How often do you work? *(number of days per week and number of hours per day)*

F9 **[IF WORK]**
On average, how much do you earn per day?

F10 Do you ever receive anything in kind?
✓ - yes *(if yes, what and from where?)* × - no

F11 What do you do with the money that you earn? *(child's own words)*

F12 Do you ever do anything that others might consider bad to get money? *(child's own words)*

Health

G1 Do you have any health problems at the moment?
✓ - yes *(if yes, what?)* × - no **[GO TO QUEST G3]**

S - skin infection
ST - stomach ache
W - worms
H - headache
R - respiratory infection
D - disability/permanent injury
E - ear/eye infection
D - diarrhea
T - teeth problems
F - fever
I - injury
O - other *(please specify)*

G2 **[IF G1 YES]**
Have you sought any treatment for the illness?
✓ - yes *(what?)* × - no *(why not?)*

G2 How often are you ill so you cannot fulfill your normal daily activities? *(child's own words)*

Attitudes, self ratings, etc.

H1 Is today a good or a bad day?
(explain and use circle scale, 1-5, and ask why the child has chosen this circle)

H2 How happy do you feel about your life?
(explain and use circle scale, 1-5, and ask why the child has chosen this circle)

H3 What is your biggest problem most of the time?
S - shelter
F - food
C - clothing
× - no problems
Other? - *please specify*

H4 Do you currently have any other problems?
✓ - yes *(if yes, what are they? - child's own words)* × - no

H5 Do you feel that you have enough support from your family?
(explain and use circle scale, 1-5, and ask why the child has chosen this circle)

H6 Do you feel that you have enough support from your friends?
(explain and use circle scale, 1-5, and ask why the child has chosen this circle)

H7 How are you feeling right now? What kind of mood are you in? *(child's own words)*

H8 What or who do you think controls your life, your successes and your failures? *(child's own words)*

H9 What are your future aspirations? What do you want to do in the future? *(child's own words)*
Do you think that you can achieve this?
✓ - yes × - no

Other information

I1 Is there anything else that you want to tell me, or that you think I should know? *(child's own words)*

Interviewers comments

J1 Appearance *(please rate on a scale of 1 - very poor to 5 - very good)*

J2 Cooperation *(please rate on a scale of 1 - very poor to 5 - very good)*

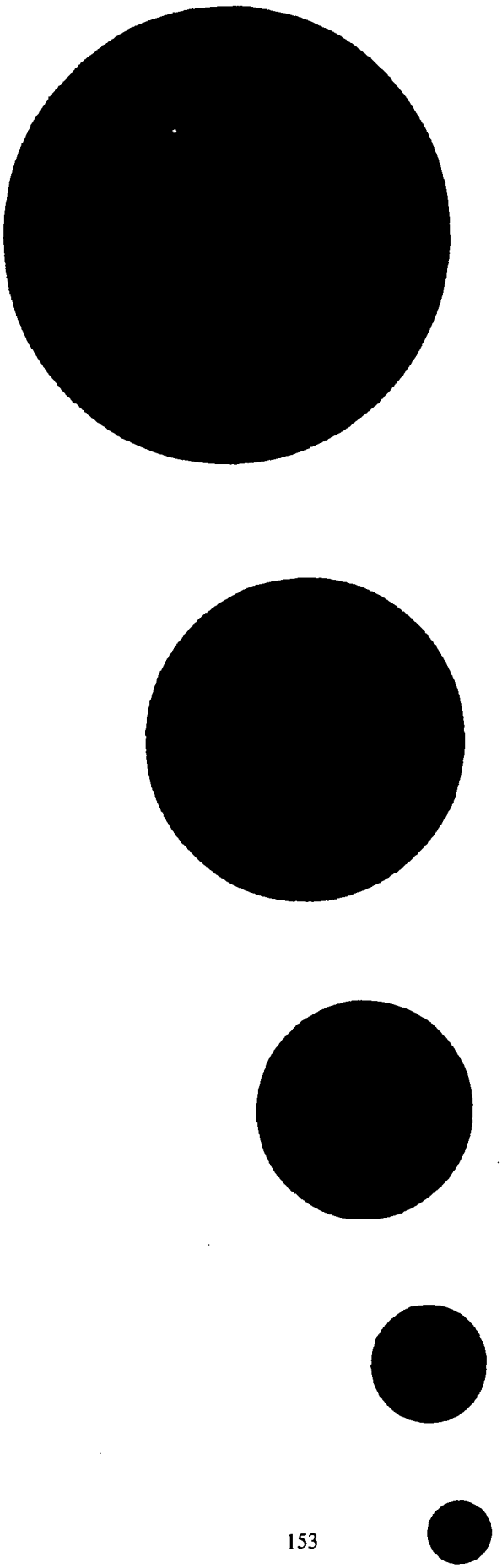
J3 Temperament

J4 Any other comments

Interview information

A5 Time interview finished *(please use Western style)*

A1.3. Circles used to assess children's feeling regarding a variety of topics



		/ /		M F	B2:age	B3:ethnicity		B4:first years	B5:when left
					yrs mths (est)	F	M	town _____ U SU admin _____ R DK	

C2:with who	C3:F home	M home	C4:when left	C5: why left	C6:shelter	C7:p shelter
	Town _____ Admin _____ U SU R DK	Town _____ Admin _____ U SU R DK			BR T M P V O _____	BR T M P DK O _____

C8:family	✓ ×	ch's age	siblings	step	sex	age	school and grade	street activity or work (if older)	sleeps	lives
F alive?			number	R S	MF	in years	× ✓ N DK	× W B P DK O	H HS S NGO DK O	AA O (U, R, SU, DK) DK
M alive?			1							
together?	T SC D		2							
F partner?			3							
M partner?			4							
Other comments:			5							
			6							
			7							
			8							
			9							

C9:f job	C10:soldier	C11:f edu	C12:m job	C12:m edu	D1:sch	D2:grade	D3:type	D4:pays	D5:ever	D6:whenleft	D7:why left
L F SV SK T B GE PE DK R N O _____	× ✓	✓ Gd _____ × RW R I SK DK	L HS SV SK HW B GE PE DK R N O _____	✓ Gd _____ × RW R I SK DK	✓ ×		PR CH P G O _____	P R S NGO O _____	✓ × Gd? ____		

D8:future?	E1:religion	E2:service	E3:cross	E4:pray	F1:streets	F2:what	F3:main work	F4:secondary work	F5:with who
✓ ×	OC M P DK CC N O _____	✓ × How often?	✓ × How often?	✓ × How often?	✓ ×	W P B O _____ _____			

F6:hurt?	F7:other work	F8:re work	F9:earnings	F10:in kind?	F11:spend on	F12:bad?	G1:health	G2:treatment	G3:ill freq
E P S × How often now? By whom? How often in past? By whom?		_____days _____hrs		✓ × what? from?			✓ × What?	✓ × What?	

H1:good/bad day	H2:happy	H3:big probs	H4:other probs	H5:fam support	H6:peer support	H7:mood	H8:control	H9:future
1 2 3 4 5 Why?	1 2 3 4 5 Comments?	S F C × Other?	✓ × What?	1 2 3 4 5 Comments?	1 2 3 4 5 Comments?			what? × ✓

E1:anything else	F1:appearance	F2:cooperation	F4:temperament	F5:comments	A5:time finished	check	check
	1 2 3 4 5	1 2 3 4 5					

A1.5. Data collection sheet for anthropometric measures

ANTHROPOMETRY DATASHEET

Date: ____________________ Time: __________ Location: ____________________ Anthropometry Sheet No: _______

I.D.	Sex M/F	Ht (cm)	Wt (kg)	UAC (cm)	Biceps (mm)				Triceps (mm)				Subscapular (mm)				Supra-iliac (mm)				Bl. pressure	Bl. pressure	Saliva ✓ ×
					1st	2nd	3rd	Av	1st	2nd	3rd	Av	1st	2nd	3rd	Av	1st	2nd	3rd	Av	Ist	2nd	Comments
																					Sy: Di: HR:	Sy: Di: HR:	
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SALIVA DATASHEET - CROSS-SECTIONAL

Date: _____ Time: _____ Location: _____ Saliva Sheet No: _____

I.D.	Sex	Time	Time	Sleep	Last Food		Last Drink		Activity				Nervous	Comments
	M/F	Now	Awoke	G/B/N	When	What (*1)	When	What (*2)	In day (*3)	In last hour (*3)	Usual? ×/✓	What was unusual? Arousal event?	1 - 5	

*1 S - shiro
I - injera
B - bread

*2 W - water
T - tea

*3 SCH - school
S - studying alone
IEDU - informal education programme
W - working
ST - on streets wandering about
T - talking with friends
P E - playing energetically
ie - football
P - playing non energetically

A1.6. Data collection sheet for cortisol analysis

A.1.7. Data collection sheet for daily activity data used in longitudinal phase

DAILY ACTIVITY

Name _____ **Location** _____

Date _____ **Time** _____ **Researcher** _____

Time	Activity (what, with whom, where, etc)	Rating 5-1*
11.00		
12.00		
1.00		
2.00		
3.00		
4.00		
5.00		
6.00		
7.00		
8.00		
9.00		
10.00		
11.00		
12.00		
.00		
.00		
.00		
.00		
.00		
.00		

The rating of 5-1 represents a great-hate scale, on a positive (5) to negative (1) scale.

1. Time saliva sample was taken MORNING _____ (EST) AFTERNOON _____ (EST)
(please circle EST if time is an estimate, i.e. unsure up to 30 minutes either side of time given)

2. Did anything unusual occur during the day as observed by the child? If yes, please expand.

3. What was the best thing that has happened today? What was it that made you the happiest today?

4. What was the worst thing that has happened today? What was it that made you the saddest today?

5. Did anything else particularly happy or sad happen today? If yes, please expand.

6. On a scale of 1-5 *(use circles with children and ring appropriate response))*
   - How good was the day? 1 2 3 4 5
   - How happy do you feel now? Why? 1 2 3 4 5
   - How worried do you feel now? Why? 1 2 3 4 5

7. Do you feel at all ill today? Did you experience any health problems at all? If yes, please say what, how it made you feel, whether it affected your behaviour at all, whether you sought any treatment, how serious you think it is, whether it makes you at all worried, etc.

8. Is there anything else that you want to say about today?

9. Is there anything else that you want to say about anything?

Researcher's comments

A2. SAMPLE CHARACTERISTICS

A2.1. Age

Table A1. Age characteristics of male children

Lifestyle group	Mean age (years)	S. D.	No.	Street living children	Street working children	Poor non-street children
Street living	12.2	1.7	69			
Street working	11.6	1.6	45	t=2.03, df=96, p=0.045		
Poor non street	11.6	1.7	27	t=1.48, df=47, p=0.1	t=0.19, df=53, p=0.9	
Middle class	10.8	1.5	40	t=4.71, df=90, p=0.001	t=2.42, df=83, p=0.02	t=2.22, df=51, p=0.03
Total males	11.7	1.7	181			

ANOVA, F=6.83, df=(3,177), p=0.001 (significant overall difference between groups)

Table A2. Age characteristics of female children

Lifestyle group	Mean age (years)	S. D.	No.	Street living children	Street working children	Poor non-street children
Street living	12.8	1.8	10			
Street working	11.5	1.6	45	t=2.14, df=12, p=0.053		
Poor non-street	10.6	1.6	44	t=3.56, df=12, p=0.004	t=2.60, df=87, p=0.01	
Middle class	10.7	1.9	40	t=3.27, df=15, p=0.005	t=0.22, df=75, p=0.8	t=0.22, df=76, p=0.8
Total female	11.1	1.8	139			

ANOVA, F=6.06, df=(3, 135), p=0.001 (significant overall difference between groups)

A2.2. Ethnographic data

Where appropriate data collected by Veae and Adefrisew (1993) for MOLSA have been added below the tables of data collected during this research to provide comparisons (referred to in tables as MOLSA 1993). MOLSA's 1993 (Veale and Adefrisew) data are generally only from children in Addis Ababa, but on occasion from all children in the study which was conducted in four towns in Ethiopia (Addis Ababa, Mekele, Nazareth and Bahir Dar). I indicate this in brackets in each table of MOLSA's1993 (Veale and Adefrisew) data (Addis or 4 towns). Of the 1,000 street children who took part in the study 76% of the children were male and 24% female, they ranged in age from 7-17 (12% were 7-9, 34% 10-12, 39% were 13-15 and 15% 16-17). MOLSA 1993 (Veale and Adefrisew) made no distinction between children *on* or *of* the street, therefore comparisons with these data should be made using an averaged figure of combining street living and street working children's data.

A second comparison has been made with more recent data from a larger MOLSA study in 1995 (referred to in the tables as MOLSA 1995). This second study involved 10,000 street children from 25 selected urban centres in Ethiopia (46% were from Addis Ababa). The data presented below are averaged over all the towns in the study. 75% of the street children were male and 25% were female, they ranged in age from 5 to 17 (10% were 5-9, 34% 10-12, 38% were 13-15 and 18% 16-17). 74% of the children in MOLSA's 19995 study were children *on* the street and 26% were children *of* the street.

Table A3. Children's birthplace by lifestyle group

Lifestyle group	Addis %	Other urban centre %	Rural place %	Abroad %	Unknown %	% (number)
Street living	44.4	40.7	11.1	1.2	2.4	100 (80)
Street working	87.8	10.0	1.1	0	1.1	100 (89)
Poor non-street	83.1	8.5	7.0	1.4	0	100 (71)
Middle class	91.3	5.0	1.3	2.5	0	100 (80)
All children	77.2	16.3	5.0	1.3	0.3	100 (320)
MOLSA 1993 (Addis Ababa)	71.0					100 (400)

16% reported other central place, 5.8% North, 4.3% South, 0.8% East and 2.1% West.

Table A4. With whom the child currently lives

Lifestyle group	Mother and father %	Mother only %	Father only %	Other kin %	Friends (inc. NGO) %	% (number)
Street living	0	0	0	0	100.0	100 (80)
Street working	31.1	47.8	6.7	14.4	0	100 (90)
Poor non-street	56.5	29.6	4.2	9.9	0	100 (71)
Middle class	81.3	6.3	7.5	4.9	0	100 (80)
All children	41.6	21.2	4.7	7.5	25.0	100 (321)
MOLSA 1993 (Addis)	33.6	28.8	2.8	9.8	6.8	100 (399)

In the MOLSA 1993 study 15% of children reported living alone, 3.3% reported "other".

Table A5. Maternal data

Lifestyle group	Is child's mother alive? %			If mother dead, she died when the child was aged: [% of all children whose mother had died]				% (number)
	yes	no	don't know	0-5	6-10	11 or above	don't know	
Street living	66.3	23.8	10.0	21.1	26.4	21.0	31.6	100 (81)
Street working	87.8	11.1	1.1	11.1	33.3	33.3	22.2	100 (90)
Poor non-street	90.1	8.5	1.4	16.7	50.1	16.7	16.7	100 (70)
Middle class	100.0	0	0	0	0	0	0	100 (80)
All children	85.4	10.8	3.7	14.7	36.4	32.3	26.5	100 (321)
MOLSA 1993 (4 towns)	82.3	17.7						100 (892)

Table A6. Paternal data

Lifestyle group	Father was a soldier %	Is child's father alive? %			If father dead, he died when the child was aged: [% of all children whose father had died]				% (number)
		yes	no	don't know	0-5	6-10	11 or above	don't know	
Street living	43.8	53.1	30.9	16.0	40.0	28.0	16.0	16.0	100 (81)
Street working	37.8	53.3	43.3	3.3	41.1	33.3	5.1	20.5	100 (90)
Poor non-street	33.8	17.1	75.7	7.1	16.6	41.6	25.0	16.7	100 (70)
Middle class	1.3	97.5	2.5	0	50	50	0	0	100 (80)
All children	29.3	68.7	24.1	7.1	28.2	39.7	14.0	17.9	100 (321)
MOLSA 1993 (4 towns)		61.2	38.8						100 (892)
MOLSA 1993 (4 towns)	24.9								100 (974)

Table A7. Parental death

Lifestyle group	Both parents alive %	One parent alive only %	Both parents dead %	Don't know about both parents %	% (number)
Street living	39.5	34.6	8.6	17.3	100 (81)
Street working	46.7	44.4	4.4	4.4	100 (90)
Poor non-street	72.9	15.7	4.3	7.1	100 (70)
Middle class	97.5	2.5	0	0	100 (80)
All children	63.2	25.2	4.4	7.1	100 (321)
MOLSA 1993 (Addis)	60.5	31.6	7.9	0	100 (393)
MOLSA 1995	52.6	39.2	6.2	2.0	100 (9648)

Table A8. Parental marital status

Lifestyle group	Parents' marital status %				Parents remarried %			% (number)
	To-gether	One or both dead*	Divor-ced	Separated due to circum-stances	Mother	Father	Both	
Street living	17.3	56.8	24.7	1.2	13.5	22.3	1.2	100 (81)
Street working	33.3	52.2	12.2	2.2	6.6	14.5	0	100 (90)
Poor non-street	58.6	22.9	10.0	7.1	2.8	1.4	0	100 (70)
Middle class	83.8	2.5	3.8	10.0	0	1.3	0	100 (80)
All children	47.7	34.6	12.8	5.0	5.7	11.1	0.3	100 (321)

* This figure includes parents about which the child knows nothing, i.e. primarily fathers who were never known to the child or left the mother when the child was young.

MOLSA 1993 (Addis)	41.7	39.5	11.7	6.1				100 (393)

1% of children responded "other" for parents' marital status.

Table A9. Family break-up data

Lifestyle group	Nuclear families remaining %	Age of child at earliest family break up event [i.e. due to parental death or parent remarrying] %				% (number)
		0-5	6-10	11 & above	unknown	
Street living	19.5	22.0	25.7	6.2	27.7	100 (81)
Street working	35.5	22.3	17.8	6.7	17.8	100 (90)
Poor non-street	65.7	4.2	15.5	4.2	10.4	100 (70)
Middle class	93.8	1.3	2.5	1.0	2.0	100 (80)
All children	52.6	13.0	16.3	4.6	13.5	100 (321)

Table A10. Siblings (mean figures are not given in whole numbers for more accurate comparative use)

Lifestyle group	Mean number of siblings:						Number
	Biological		Step		Total		
	Mean	S.D.	Mean	S.D.	Mean	S.D.	
Street living	1.4	1.1	0.4	0.8	1.8	1.0	75
Street working	2.3	1.7	0.5	1.0	2.8	1.5	90
Poor non-street	2.9	1.9	0.3	0.7	3.2	1.8	70
Middle class	2.7	1.8	0.04	0.3	2.7	1.8	80
All children	2.3	1.7	0.3	0.8	2.6	1.6	315

Table A11. Siblings

Lifestyle group	% of children who were:				% (number)
	eldest sibling	middle child	youngest sibling	only child	
Street living	28.0	28.0	37.3	5.3	100 (75)
Street working	23.3	44.4	28.9	2.2	100 (90)
Poor non-street	14.3	51.4	31.4	2.9	100 (70)
Middle class	15.0	36.3	45.0	3.8	100 (80)
All children	20.3	40.3	35.6	3.5	100 (315)

Table A12. Siblings' work

Lifestyle group	Children with at least one other sibling working on the street %	Children with no other siblings working on the street %	Unknown or below appropriate age %	% (number)
Street living	23.1	57.7	23.1	100 (78)
Street working	46.7	47.8	5.6	100 (90)
Poor non-street	25.7	68.6	5.7	100 (70)
All less privileged	31.5	57.1	11.3	100 (238)

	Siblings who work or beg on the streets %	Siblings not working or begging on the streets %	Did not know %	% (number)
MOLSA 1993 (4 towns)	26.8	71.3	1.9	100 (2103)

Table A13.. School attendance

Lifestyle group	Does child go to school? %		%
	yes	no	(number)
Street living children	57.0	43.0	100 (81)
Street working children	92.2	7.8	100 (90)
Poor non-street children	100.0	0.0	100 (70)
Middle class children	100.0	0.0	100 (80)
All children	87.2	12.8	100 (231)
MOLSA 1993 (Addis)	48.5	51.5	100 (397)
MOLSA 1995	52.9	47.1	100 (9871)

Table A14. Time living on streets

Time on streets (years)	No. of street living children	% of street living children	MOLSA 1995 %
missing data	17	21.0	
<1	8	9.9	30.2
1-2	7	8.6	25.1
2-3	13	16.0	18.9
3-4	12	14.8	12.5
4-5	9	11.1	6.6
5-6	4	4.9	
6-7	6	7.4	6.8
7-8	3	3.7	
>8	2	2.4	
Total	81	100	100

n=9,904

Table A15. Reported main problems

Lifestyle group	Main problem %					%
	nothing	food	clothes	shelter	other	(number)
Street living	3.8	8.8	60.0	25.0	2.5	100 (80)
Street working	6.7	29.2	33.7	29.2	1.1	100 (89)
Poor non-street	49.3	9.9	26.8	11.3	2.8	100 (71)
Middle class	100.0	0	0	0	0	100 (80)
All children	38.8	12.5	30.3	16.9	1.6	100 (320)
MOLSA 1993 (4 towns)	15.3	62.6	0	4.5	17.6	100 (1000)

Table A16. Current illness

Category (lifestyle/sex)	Current illness reported %	No current illness reported %	% (number)
Street living children	22.5	77.5	100 (80)
Street working children	41.1	58.9	100 (90)
Poor non-street children	42.3	57.7	100 (71)
Middle class children	31.6	68.4	100 (79)
Males	28.2	71.8	100 (181)
Females	42.0	58.0	100 (138)
All children	37.2	62.8	100 (319)

Table A17. Child rated family support

Lifestyle group	Family support ratings					Family support ratings		No.
	1	2	3	4	5	Mean	S.D.	
Street living children	80.0	10.0	8.8	1.3	0	1.31	0.69	80
Street working children	4.4	47.8	26.7	13.3	7.8	2.68	0.97	90
Poor non-street children	1.4	9.9	32.4	22.5	33.8	3.76	1.07	71
Middle class children	0	0	0	3.8	96.3	4.96	0.19	80
All children	21.5	18.1	16.8	10.0	33.6	3.14	1.57	321

Table A18. Child rated peer support

Lifestyle group	Peer support ratings					Peer support ratings		No.
	1	2	3	4	5	Mean	S.D.	
Street living children	5.0	8.8	6.3	15.0	65.0	4.26	1.21	80
Street working children	64.4	11.5	8.0	4.6	11.5	1.87	1.40	90
Poor non-street children	77.1	8.6	4.3	4.3	5.7	1.53	1.14	71
Middle class children	53.2	20.3	7.6	11.4	7.6	2.00	1.33	80
All children	49.4	12.3	6.6	8.9	22.8	2.43	1.67	321

Table A19. Who child believes to control their lives

Lifestyle group	God %	Kin %	Other inc. NGO %	Self %	Don't know %	% (number)
Street living children	3.7	6.2	1.6	74.1	2.5	100 (80)
Street working children	4.4	75.6	0	14.4	5.5	100 (90)
Poor non-street children	5.6	81.7	0	7.0	5.6	100 (71)
Middle class children	0	88.8	0	7.5	3.8	100 (80)
All children	3.4	62.5	3.4	26.0	4.6	100 (321)

A3. CORTISOL DATA DESCRIPTION

A3.1. Time of samples for cross sectional data

Table A20. Time of sample (observed) and time of sample since waking (calculated from reported data) for males

Lifestyle group	Sample time (hr:min)		Sample time since waking (hr:min)		Number
	Mean	S. D.	Mean	S. D.	
Street living	12:59	2:37	5:44	3:01	70
Street working	12:35	2:50	5:11	3:01	45
Poor non-street	12:38	2:40	5:44	2:41	27
Middle class	11:46	2:00	4:38	2:07	40
All males	12:34	2:35	5:22	2:49	182

ANOVA (sample time), F=1.94, df=(3,178), p=0.1 (no overall significant difference between groups)
ANOVA (sample time since waking), F=1.54, df=(3,178), p=0.2 (no overall significant difference between groups)

Table A21. Time of sample (observed) and time of sample since waking (calculated from reported data) for females

Lifestyle group	Sample time (hr:min)		Sample time since waking (hr:min)		Number
	Mean	S.D.	Mean	S. D.	
Street living	12:07	2:39	4:41	2:41	11
Street working	12:17	2:28	4:59	2:41	45
Poor non-street	12:53	2:40	5:44	2:35	44
Middle class	12:40	1:52	5:38	2:02	40
All females	12:34	2:23	5:23	2:29	140

ANOVA (sample time), F=0.60, df=(3,136), p=0.6 (no overall significant difference between groups)
ANOVA (sample time since waking), F=0.95, df=(3,136), p=0.4 (no overall significant difference between groups)

A3.2. Longitudinal Cortisol sample numbers

Table A22. Summary of number of samples of longitudinal cortisol data for males

Lifestyle group	Morning		Afternoon		Total		Number of children
	Number of samples	Mean number of samples per child	Number of samples	Mean number of samples per child	Number of samples	Mean number of samples per child	
Street living	78	6.0	77	5.9	155	11.9	13
Street working	42	6.0	39	5.6	81	11.6	7
Poor non street	18	6.0	16	5.3	34	11.3	3
Middle class	41	5.1	40	5.0	81	10.1	8
All males	179	5.8	172	5.6	351	11.3	31

Table A23. Summary of number of samples of longitudinal cortisol data for females

Lifestyle group	Morning		Afternoon		Total		Number of children
	Number of samples	Mean number of samples per child	Number of samples	Mean number of samples per child	Number of samples	Mean number of samples per child	
Street living	34	5.7	35	5.8	69	11.5	6
Street working	39	5.6	38	5.4	77	11.0	7
Poor non street	35	5.8	28	4.7	63	10.5	6
Middle class	45	5.6	41	5.1	86	11.7	8
All females	153	5.7	142	5.3	295	10.9	27

A3.3. Longitudinal Cortisol time of samples

Table A24. Sample time data for all children (mean of means for each child) for males

Lifestyle group	Absolute time of sample				Time of sample since waking				Number of children
	Morning		Afternoon		Morning		Afternoon		
	Mean	S.D	Mean	S.D.	Mean	S.D.	Mean	S.D	
Street living	7:43	0:58	15:40	0:55	0:56	0:10	9:53	1:51	13
Street working	8:36	0:31	14:41	0:04	1:43	0:22	7:49	0:26	7
Poor non street	8:20	0:10	14:45	0:12	1:47	0:08	8:12	0:18	3
Middle class	8:10	0:20	15:29	0:07	1:29	0:41	8:50	0:30	8
All males	8:05	0:46	15:19	0:43	1:20	0:31	8:34	1:18	31

Table A25. Sample time data for all children (mean of means for each child) for females

Lifestyle group	Absolute time of sample				Time of sample since waking				Number of children
	Morning		Afternoon		Morning		Afternoon		
	Mean	S.D	Mean	S.D.	Mean	S.D.	Mean	S.D	
Street living	7:06	0:02	14:41	0:15	0:41	0:07	8:17	0:20	6
Street working	9:56	0:08	15:04	0:15	1:53	0:39	8:01	0:46	7
Poor non street	8:28	0:20	14:52	0:13	1:34	0:11	7:58	0:22	6
Middle class	8:07	0:10	15:15	0:15	1:07	0:28	8:35	0:40	8
All females	8:10	0:41	15:05	0:25	1:19	0:37	8:14	0:37	27

A4. RESULTS

A4.1. Absolute height and weight

Table A26. Mean height and weight measurements by lifestyle groups for all children

Lifestyle group	Height (m)		Weight (kg)		Number
	Mean	S. D.	Mean	S.D.	
Street living children	1.417	0.109	32.6	6.9	80
Street working children	1.401	0.103	31.6	6.7	90
Poor non-street children	1.360	0.104	28.6	6.2	70
Middle class children	1.410	0.111	33.1	9.2	80
All children	1.398	0.108	31.6	7.5	320

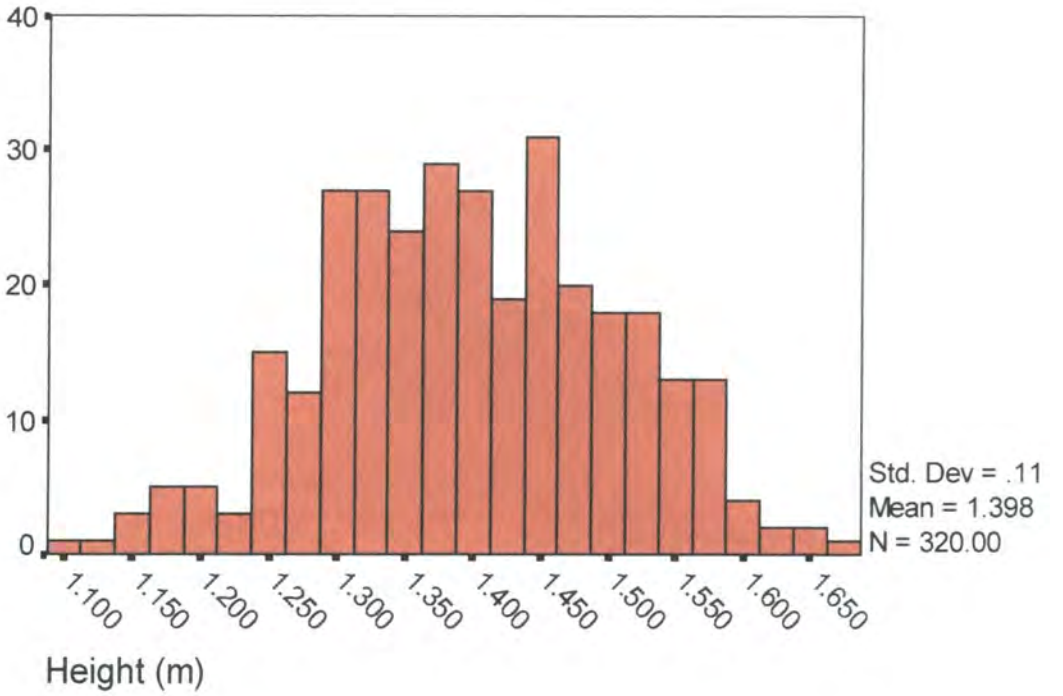
Table A27. Mean height and weight measurements by lifestyle groups for males

Lifestyle group	Height (m)		Weight (kg)		Number
	Mean	S. D.	Mean	S.D.	
Street living children	1.415	0.109	31.9	6.6	69
Street working children	1.391	0.102	30.2	5.7	45
Poor non-street children	1.373	0.118	29.3	6.1	26
Middle class children	1.416	0.103	32.9	7.3	40
All male children	1.403	0.108	31.3	6.5	180

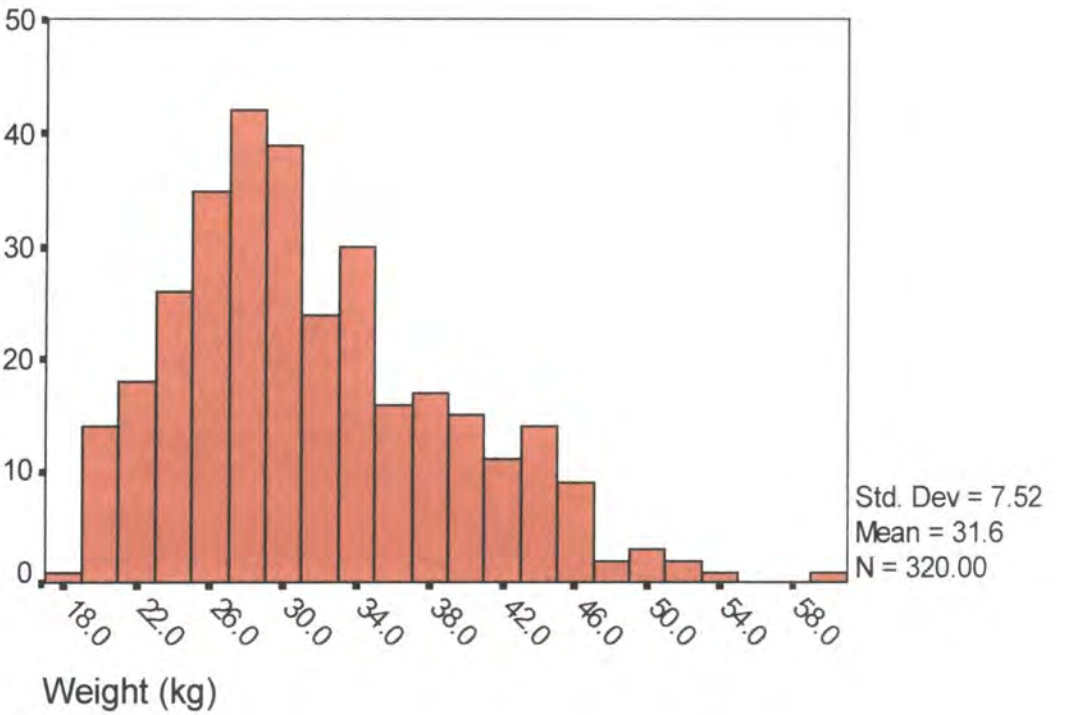
Table A28. Mean height and weight measurements by lifestyle groups for females

Lifestyle group	Height (m)		Weight (kg)		Number
	Mean	S. D.	Mean	S.D.	
Street living children	1.434	0.108	37.1	7.6	11
Street working children	1.411	0.105	33.1	7.4	45
Poor non-street children	1.352	0.094	28.2	6.3	44
Middle class children	1.402	0.119	33.4	10.8	40
All female children	1.392	0.109	32.0	8.6	140

Graph A1. Height distribution, number of children of each height



Graph A2. Weight distribution, number of children of each weight



A4.2. Growth status

Tables A29. Comparison of growth status by lifestyle group for males

Lifestyle group	Height-for-age z-score			Weight-for-age z-score			Weight-for-height z-score		
	Mean	S.D.	No.	Mean	S.D.	No.	Mean	S.D.	No.
Street living	-1.70	0.83	68	-1.76	0.68	68	-0.79	0.61	68
Street working	-1.50	0.88	45	-1.61	0.60	45	-0.76	0.62	45
Poor non-street	-1.81	0.94	26	-1.89	0.62	27	-0.91	0.72	27
Middle class	-0.53	0.84	40	-0.76	0.87	40	-0.62	0.88	37
All male children	-1.40	0.98	179	-1.57	0.81	180	-0.77	0.69	177

Table A30. Comparison of growth status by lifestyle group for females

Lifestyle group	Height-for-age z-score			Weight-for-age z-score			Weight-for-height z-score		
	Mean	S.D.	No.	Mean	S.D.	No.	Mean	S.D.	No.
Street living	-2.19	0.86	10	-1.46	0.41	10	-0.27	0.43	10
Street working	-1.34	0.80	45	-1.23	0.59	45	-0.47	0.67	45
Poor non-street	-1.44	0.85	44	-1.51	0.59	44	-0.82	0.74	43
Middle class	-0.59	0.82	39	-0.90	0.77	39	-0.61	0.96	39
All female	-1.22	0.92	138	-1.25	0.68	138	-0.62	0.76	137

Tables A31. Proportions of classified stunting (from HAz) by lifestyle group for all children

Lifestyle group	Adequate (%)		Mild stunting (%)		Moderate stunting (%)		Severe stunting (%)		Number	
Street living	17	(21.0)	33	(40.7)	28	(34.6)	3	(3.7)	81	(100)
Street working	28	(31.1)	37	(41.1)	24	(26.7)	1	(1.1)	90	(100)
Poor non-street	16	(22.9)	30	(42.9)	20	(28.6)	4	(5.7)	70	(100)
Middle class	61	(77.2)	14	(17.7)	4	(5.1)	0		79	(100)
All children	122	(38.1)	114	(35.6)	76	(23.8)	8	(2.5)	320	(100)

Tables A32. Proportions of classified stunting (from HAz) by lifestyle group for males

Lifestyle group	Adequate (%)		Mild stunting (%)		Moderate stunting (%)		Severe stunting (%)		Number	
Street living	15	(21.4)	30	(42.9)	24	(34.3)	1	(1.4)	70	(100)
Street working	14	(31.1)	17	(37.8)	13	(28.9)	1	(2.2)	45	(100)
Poor non-street	5	(19.2)	10	(38.5)	8	(30.8)	3	(11.5)	26	(100)
Middle class	33	(82.5)	5	(12.5)	2	(5.0)	0		40	(100)
All males	67	(37.0)	62	(34.3)	47	(26.0)	5	(2.8)	181	(100)

Tables A33. Proportions of classified stunting (from HAz) by lifestyle group for females

Lifestyle group	Adequate (%)		Mild stunting (%)		Moderate stunting (%)		Severe stunting (%)		Number	
Street living	2	(18.2)	3	(27.3)	4	(36.4)	2	(18.2)	11	(100)
Street working	14	(31.1)	20	(44.4)	11	(24.4)	0		45	(100)
Poor non-street	11	(25.0)	20	(45.5)	12	(27.5)	1	(2.3)	44	(100)
Middle class	28	(71.8)	9	(23.1)	2	(5.1)	0		39	(100)
All females	55	(39.6)	52	(37.4)	29	(20.9)	3	(2.2)	139	(100)

Tables A34. Proportions of underweight (from WAz) by lifestyle group for all children

Lifestyle group	Adequate (%)		Mildly underweight (%)		Moderately underweight (%)		Severely underweight (%)		Number	
Street living	10	(12.3)	44	(54.3)	25	(30.9)	2	(2.5)	81	(100)
Street working	15	(16.7)	59	(65.6)	16	(17.8)	0		90	(100)
Poor non-street	11	(15.5)	35	(49.3)	25	(35.2)	0		71	(100)
Middle class	42	(53.2)	34	(43.0)	3	(3.8)	0		79	(100)
All children	79	(24.5)	172	(53.4)	69	(21.4)	2	(0.6)	322	(100)

Tables A35. Proportions of underweight (from WAz) by lifestyle group for males

Lifestyle group	Adequate (%)		Mildly underweight (%)		Moderate ly underweight (%)		Severely underweight (%)		Number	
Street living	8	(11.4)	36	(51.4)	24	(34.3)	2	(2.9)	70	(100)
Street working	5	(11.1)	27	(60.0)	13	(28.9)	0		45	(100)
Poor non-street	3	(11.1)	11	(40.7)	13	(48.1)	0		27	(100)
Middle class	21	(52.5)	17	(42.5)	2	(5.0)	0		40	(100)
All males	37	(20.3)	91	(50.5)	52	(28.6)	2	(1.1)	182	(100)

Tables A36. Proportions of underweight (from WAz) by lifestyle group for females

Lifestyle group	Adequate (%)		Mildly underweight (%)		Moderately underweight (%)		Severely underweight (%)		Number	
Street living	2	(18.2)	8	(72.7)	1	(9.1)	0		11	(100)
Street working	10	(22.2)	32	(71.1)	3	(6.7)	0		45	(100)
Poor non-street	8	(18.2)	24	(54.5)	12	(27.3)	0		44	(100)
Middle class	21	(53.8)	17	(43.6)	1	(2.6)	0		39	(100)
All females	41	(29.5)	81	(58.3)	17	(12.2)	0		138	(100)

Tables A37. Proportions of wasting (from WHz) by lifestyle group for all children

Lifestyle group	Adequate (%)		Mild wasting (%)		Moderate wasting (%)		Severe wasting (%)	Number	
Street living	57	(70.4)	21	(25.9)	3	(3.7)	0	81	(100)
Street working	70	(77.8)	20	(22.2)	0		0	90	(100)
Poor non-street	44	(62.9)	21	(30.0)	5	(7.1)	0	70	(100)
Middle class	48	(61.5)	28	(35.9)	2	(2.6)	0	78	(100)
All children	222	(68.8)	90	(28.1)	10	(3.1)	0	320	(100)

Tables A38. Proportions of wasting (from WHz) by lifestyle group for males

Lifestyle group	Adequate (%)		Mild wasting (%)		Moderate wasting (%)		Severe wasting (%)	Number	
Street living	46	(65.7)	21	(30.0)	3	(4.3)	0	70	(100)
Street working	33	(73.3)	12	(26.7)	0		0	45	(100)
Poor non-street	15	(55.6)	11	(40.7)	1	(3.7)	0	27	(100)
Middle class	25	(64.1)	13	(33.3)	1	(2.6)	0	39	(100)
All males	119	(65.7)	57	(31.5)	5	(2.8)	0	181	(100)

Tables A39. Proportions of wasting (from WHz) by lifestyle group for females

Lifestyle group	Adequate (%)		Mild wasting (%)		Moderate wasting (%)		Severe wasting (%)	Number	
Street living	11	(100.0)	0		0		0	11	(100)
Street working	37	(82.2)	8	(17.8)	0		0	45	(100)
Poor non-street	29	(37.4)	10	(23.3)	4	(9.3)	0	43	(100)
Middle class c	23	(59.0)	15	(38.4)	1	(2.6)	0	39	(100)
All females	100	(72.5)	33	(23.9)	5	(3.6)	0	138	(100)

A4.3. Body composition

Table A40. Mean body composition measurements for males

Lifestyle group	**Sum of skinfolds, SSF (mm)**			**Mid upper arm circumference, MUAC (mm)**		
	Mean	S.D.	No.	Mean	S.D.	No.
Street living children	22.30	4.61	70	18.91	1.87	70
Street working children	20.44	3.72	45	18.56	1.46	45
Poor non-street children	21.65	8.53	26	18.29	2.03	26
Middle class children	32.94	12.19	40	20.07	2.73	40
All male children	24.10	8.76	181	18.99	2.10	181

Table A41. Mean body composition measurements for females

Lifestyle group	Sum of skinfolds, SSF (mm)			Mid upper arm circumference, MUAC (mm)		
	Mean	S.D.	No.	Mean	S.D.	No.
Street living children	40.24	10.99	11	21.31	2.43	11
Street working children	33.31	11.75	44	20.06	2.56	45
Poor non-street children	24.78	7.81	44	18.61	2.25	44
Middle class children	33.99	13.32	35	20.38	3.64	40
All female children	31.26	11.95	134	19.79	2.92	140

A4.4. Cross sectional cortisol data

Table A42. Absolute cortisol level means for samples collected in the morning by lifestyle group for males

Lifestyle group	AM cortisol (μg/dL)			Time since waking (hr:min)		Time of sample (hr:min)		No.
	Mean	S.D.	Median	Mean	S.D.	Mean	S.D.	
Street living	0.199	0.150	0.156	2:35	1:10	10:08	0:50	30
Street working	0.199	0.078	0.172	2:50	1:16	10:11	0:47	24
Poor non-street	0.214	0.068	0.214	3:09	0:50	9:58	0:30	12
Middle class	0.191	0.105	0.176	3:23	0:59	10:32	0:58	27
All males	0.198	0.111	0.174	2:57	1:08	10:15	0:50	93

Table A43. Absolute cortisol level means for samples collected in the morning by lifestyle group for females

Lifestyle group	AM cortisol (μg/dL)			Time since waking (hr:min)		Time of sample (hr:min)		No.
	Mean	S.D.	Median	Mean	S.D.	Mean	S.D.	
Street living	0.266	0.145	0.259	2:32	1:30	9:32	1:16	5
Street working	0.240	0.130	0.238	3:15	1:38	10:29	0:45	28
Poor non-street	0.260	0.140	0.220	3:04	1:35	9:56	1:11	17
Middle class	0.214	0.128	0.200	3:42	0:56	10:53	0:32	19
All females	0.240	0.131	0.226	3:17	1:27	10:23	0:57	69

Table A44. Absolute cortisol level means for samples collected in the afternoon by lifestyle group for males

Lifestyle group	PM cortisol (μg/dL)			Time since waking (hr:min)		Time of sample (hr:min)		No.
	Mean	S.D.	Median	Mean	S.D.	Mean	S.D.	
Street living	0.160	0.083	0.151	8:54	1:20	15:08	0:47	40
Street working	0.153	0.065	0.170	7:52	1:58	15:20	1:26	21
Poor non-street	0.224	0.140	0.198	7:49	1:35	14:46	1:25	15
Middle class	0.139	0.053	0.124	7:14	1:13	14:19	0:44	13
All males	0.166	0.091	0.156	7:22	1:32	15:00	1:07	89

Table A45. Absolute cortisol level means for samples collected in the afternoon by lifestyle group for females

Lifestyle group	PM cortisol (μg/dL)			Time since waking (hr:min)		Time of sample (hr:min)		No.
	Mean	S.D.	Median	Mean	S.D.	Mean	S.D.	
Street living	0.214	0.108	0.217	6:40	1:49	14:17	0:37	6
Street working	0.144	0.069	0.125	7:52	1:02	15:17	0:41	17
Poor non-street	0.178	0.072	0.197	7:22	1:27	14:44	1:17	27
Middle class	0.175	0.101	0.167	7:23	0:46	14:17	0:50	21
All females	0.172	0.084	0.169	7:26	1:14	14:42	1:30	71

Table A46. Logged cortisol residual means by lifestyle group, with paired lifestyle group differences for males

Lifestyle group	Logged cortisol residual value	S. D.	No.	Street living children	Street working children	Poor non-street children
Street living	-0.082	0.594	70			
Street working	-0.044	0.502	45	t=0.37, df=105, p=0.0.7		
Poor non-street	0.168	0.497	27	t=2.09, df=56, p=0.04	t=1.74, df=55, p=0.09	
Middle class	-0.124	0.496	40	t=0.40, df=94, p=0.7	t=0.74, df=82, p=0.5	t=2.36, df=56, p=0.02
All males	-0.044	0.541	182			

ANOVA, F=1.81, df=(3,178), p=0.1 (no significant overall difference between groups)

Table A47. Logged cortisol residual means by lifestyle group, with paired lifestyle group differences for females

Lifestyle group	Logged cortisol residual value	S. D.	No.	Street living children	Street working children	Poor non-street children
Street living	0.214	0.512	11			
Street working	0.008	0.621	45	t=1.43, df=18, p=0.3		
Poor non-street	0.132	0.459	44	t=0.49, df=14, p=0.6	t=1.07, df=81, p=0.3	
Middle class	-0.011	0.592	40	t=1.24, df=18, p=0.2	t=0.14, df=83, p=0.9	t=1.22, df=73, p=0.2
All females	0.058	0.557	140			

ANOVA, F=0.86, df=(3,136), p=0.5 (no significant overall difference between groups)

A4.5. Longitudinal cortisol data

Table A48. Absolute cortisol level means for samples collected in the morning by lifestyle group for males

Lifestyle group	AM cortisol (μg/dL)			Time since waking (hr:min)		Time of sample (hr:min)		Number	
	Mean	S.D.	Median	Mean	S.D.	Mean	S.D.	samples	kids
Street living	0.359	0.122	0.336	0:56	0:10	7:43	0:58	78	13
Street working	0.444	0.134	0.426	1:43	0:22	8:36	0:31	42	7
Poor non-street	0.478	0.120	0.415	1:47	0:78	8:20	0:10	18	3
Middle class	0.346	0.141	0.354	1:30	0:41	8:10	0:20	41	8
All males	0.386	0.132	0.371	1:20	0:31	8:05	0:46	179	31

ANOVA, time since waking, F=2.58, df=(3,27), p=0.07 (no significant overall difference between groups)

ANOVA, absolute time of sample, F=7.95, df=(3,27), p=0.0006 (significant difference between groups)

Table A49. Absolute cortisol level means for samples collected in the morning by lifestyle group for females

Lifestyle group	AM cortisol (μg/dL)			Time since waking (hr:min)		Time of sample (hr:min)		Number	
	Mean	S.D.	Median	Mean	S.D.	Mean	S.D.	samples	kids
Street living	0.450	0.102	0.415	0:41	0:07	7:06	0:02	34	6
Street working	0.404	0.166	0.410	1:53	0:39	8:56	0:08	39	7
Poor non-street	0.472	0.117	0.468	1:34	0:11	8:28	0:22	35	6
Middle class	0.312	0.098	0.297	1:07	0:28	8:07	0:10	45	8
All females	0.402	0.133	0.400	1:20	0:37	8:11	0:41	153	27

ANOVA, time since waking, F=9.35, df=(3,23), p=0.0003 (significant overall difference between groups)

ANOVA, absolute time of sample, F=101.62, df=(3,23), p=0.0001 (significant difference between groups)

Table A50. Absolute cortisol level means for samples collected in the afternoon by lifestyle group for males

Lifestyle group	PM cortisol (μg/dL)			Time since waking (hr:min)		Time of sample (hr:min)		Number	
	Mean	S.D.	Median	Mean	S.D.	Mean	S.D.	samples	kids
Street living	0.181	0.115	0.131	8:53	1:51	15:40	0:55	77	13
Street working	0.253	0.095	0.264	7:49	0:26	14:41	0:04	39	7
Poor non-street	0.214	0.024	0.213	8:12	0:19	14:45	0:12	16	3
Middle class	0.190	0.095	0.146	8:50	0:30	15:29	0:07	40	8
All males	0.203	0.101	0.175	5:34	1:19	15:19	0:43	172	31

ANOVA, time since waking, F=1.29, df=(3,27), p=0.3 (no significant overall difference between groups)

ANOVA, absolute time of sample, F=4.89, df=(3,27), p=0.008 (significant difference between groups)

Table A51. Absolute cortisol level means for samples collected in the afternoon by lifestyle group for females

Lifestyle group	**PM cortisol (μg/dL)**			**Time since waking (hr:min)**		**Time of sample (hr:min)**		**Number**	
	Mean	S.D.	Median	Mean	S.D.	Mean	S.D.	samples	kids
Street living	0.127	0.045	0.130	8:17	0:20	14:41	0:15	35	6
Street working	0.240	0.055	0.263	8:01	0:46	14:04	0:15	38	7
Poor non-street	0.216	0.054	0.219	7:58	0:22	14:52	0:13	28	6
Middle class	0.157	0.065	0.141	8:35	0:40	15:35	0:16	41	8
All females	0.185	0.070	0.188	8:14	0:37	15:05	0:25	142	27

ANOVA, time since waking, F=1.70, df=(3,23), p=0.2 (no significant overall difference between groups)

ANOVA, absolute time of sample, F=17.65, df=(3,23), p=0.0001 (significant difference between groups)

Table A52. Coefficient of variation in cortisol for boys (absolute values uncorrected for variation in sample time)

Lifestyle group	Morning			Afternoon			Number of children
	Mean	Minimum	Maximum	Mean	Minimum	Maximum	
Street living	43	17	71	65	39	97	13
Street working	44	32	56	41	22	57	7
Poor non street	34	26	39	50	39	62	3
Middle class	50	29	65	67	33	106	8
All children	44	17	71	58	22	106	31

ANOVA, AM, F=0.94, df=(3,27), p=0.4 (no significant overall difference between groups)
ANOVA, PM, F=3.10, df=(3,27), p=0.04 (significant overall difference between groups)

Table A53. Coefficient of variation in cortisol for girls (absolute values uncorrected for variation in sample time)

Lifestyle group	Morning			Afternoon			Number of children
	Mean	Minimum	Maximum	Mean	Minimum	Maximum	
Street living	48	17	88	61	24	92	6
Street working	39	11	57	35	11	77	7
Poor non street	50	36	75	58	42	77	6
Middle class	51	25	67	66	18	113	8
All children	47	11	88	55	11	113	27

ANOVA, AM, F=0.41, df=(3,23), p=0.7 (no significant overall difference between groups)
ANOVA, PM, F=2.02, df=(3,23), p=0.1 (no significant overall difference between groups)